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NBS TECHNICAL NOTE 568

Simulation of Air Traffic Control Radar Beacon Code Assignment Plans

Final Report

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NBS TECHNICAL NOTE 568

ISSUED MARCH 1971

Nat. Bur. Stand. (U.S.), Tech. Note 568, 76 pages (Mar. 1971)
CODEN: NBTNA

Simulation of Air Traffic Control Radar Beacon Code Assignment Plans

Final Report

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Sponsored by the
Department of Transportation
Federal Aviation Administration
Inter-agency Agreement DOT-FA69WAI-162

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Stock Number 0303-0847

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Simulation of Air Traffic Control Radar Beacon Code Assignment Plans

Final Report

R.D. Elbourn and J.F. Gilsinn

In the Air Traffic Control Radar Beacon System transponders in the aircraft use one of 4096 identity codes when replying to interrogation from the Secondary Surveillance Radar. Two types of plans for assigning identity codes to aircraft were tested by simulating in a digital computer a peak day's IFR traffic in the USA. In one type each Air Route Traffic Control Center assigns codes independently of all the others, while in the other type a single master center makes all the code assignments for the USA. Four other types of plans are discussed, and an assignment plan of mixed type is proposed for further study. The strategy of simulation and the use of the SIMSCRIPT language are discussed in an appendix.

Key words: Air traffic control; beacon code assignment; digital simulation; radar beacon system.

1. Introduction

The primary, skin-reflection radar used for air traffic control is supplemented by a Secondary Surveillance Radar or Air Traffic Control Radar Beacon System (ATCRBS), which employs radar beacon transponders in the aircraft. Interrogation from the ground by the proper signal causes the transponder to reply with a special pulse sequence that is one of 4096 discrete identification codes. If instrument flight rule (IFR) traffic in the USA triples by 1980, as is predicted, there will be many more aircraft flying IFR in the USA during a busy hour than there are beacon codes. Thus arises the problem of how to assign codes to aircraft so that the same code can be used simultaneously by

several aircraft in the USA, yet two aircraft using the same code will not come into the same area and have their identities confused. This report describes a study of various radar beacon code assignment plans by using a digital computer to simulate their operation on a peak day's IFR traffic in the USA.

For human recognition a beacon code is represented by four octal digits in the range 0000 to 7777. A pilot can set his transponder to any beacon code just by flipping four eight-position thumbwheels. Nevertheless, it is desirable to minimize code changes in flight because each change requires another controller-to-pilot communication, and there is always a chance of turning to a wrong code.

By 1973 a computer-based semi-automatic system for air traffic control is expected to be installed in most large and medium enroute and terminal ATC facilities. In such a system a computer uses radar data to track each aircraft under control and files the data on each aircraft under a unique track number. The beacon code that accompanies a secondary radar reply is not normally of concern to the controller, but is used by the computer to find directly the number of the track that should be updated.

To appreciate how much computer work the beacon code saves, one might recall that the largest single task of the computers in the SAGE air defense system was correlating new radar returns with the proper tracks. Now what happens to this system if two aircraft with different track numbers have the same beacon code? The computer may start to update the wrong track, but the new position coordinates will usually be so different from the old that it will be apparent that this

is the wrong track, and the computer should look for another track having the same beacon code. Only when the two tracks cross in nearly the same position should identity be in danger of interchange. However, because there is some burden on the computer in rejecting wrong correlations, all the code assignment plans considered in this study have incorporated the conservative rule that no two aircraft may use the same beacon code within the area controlled by one Air Route Traffic Control Center (ARTCC). This rule keeps beacon codes as well as track numbers unique within the area served by a single computer.

This computer may receive data from a radar that is sited near the boundary between two control areas, so that it looks into both areas. Such a radar may well see two aircraft, one in each area, with the same beacon code. We assume that in this case the computer will use the geographical separation of the targets to decide as described above which radar return comes from the aircraft it is tracking.

Code plans in this study are all intended for use in the semi-automatic system. In Section 7 there is some discussion of compatibility with the present 64-code manual system, but these two systems use codes for completely different purposes. In the manual system beacon codes permit the selective display of targets by classes such as arriving aircraft, departing aircraft, or aircraft in the high altitude sector. They are not used for individual identity. The semi-automatic system does not need to get this classification information from the beacon code; it has the information in the computer's file record and incorporates it in the alphanumeric display.

Another rule, adopted for all simulations after the initial phase of this study, is that beacon codes are assigned to flights 30 minutes before departure. This, however, is an adjustable parameter in the computer programs.

2. The Simulation Model

The problem of generating a representative sample of air traffic for testing a code plan was solved by the FAA's giving to NBS in April 1969 a magnetic tape called a Peak Day's IFR Traffic Tape for the USA. This tape describes 31,598 flights by giving the following flight plan data on each:

1. Aircraft identity
2. User class; i.e.
   Air carrier
   General aviation, or
   Military
3. Aircraft type
4. True airspeed
5. Departure airport
6. Flying altitude
7. Destination airport
8. Departure time

Notice that in this usage a flight lasts only from take-off to landing. The continuation after an intermediate stop is another flight.

Because we do not have a peak day traffic tape for the projected traffic of 1980, the 1969 traffic is used, but code assignment plans are sought that will work with many fewer than 4096 codes,

in fact fewer than 1000. It will be shown that the plans we simulate require a number of codes proportional to the traffic served; hence this policy leaves room for at least a three times increase in traffic as well as the reservation of some codes by the military. The ratio of the number of aircraft served to the number of codes used is an important measure of goodness in an assignment plan.

Instead of describing the complete airways structure of the USA within the simulation model and routing the flights via the airways, it was considered adequate to use straight line flight paths from the departure airport to the destination airport. Rather than true great circles the paths of simulated flight are straight lines on a flat map. The map projection is Lambert Conformal Conic with standard parallels at 33° and 45° north latitude. Thus it became necessary to look up the latitude and longitude of each airport mentioned on the Peak Day Tape and to convert these into x, y map coordinates. Places were omitted in the following circumstances:

1. The identifier recorded on the tape was not in the list of location identifiers.
2. The airport was outside the contiguous 48 states.
3. The location was an airways intersection rather than an airport.
4. The airport was not listed in either the IFR-or VFR-Supplements (DOD Flight Information Publication (Enroute)).
5. The airport was not on a list supplied by the FAA and had fewer than 10 operations on the Peak Day Tape.

The result was a list of 1113 airports and 27,692 flights between these airports. These flights were recorded on the exogenous events tapes used to drive the simulation programs. International flights are not included but in comparison with domestic flights their volume is small.

At the start of the simulated day there should be a representative number of flights already in progress, otherwise it would take several hours for traffic to build up to its proper density, and during these early hours there would be too few handoffs between control centers and too few arrivals at destinations. The end of the simulated day occurs at the same hour as the beginning, so the most obvious solution is to record the status of those flights in progress at the end of the day, make their times 24 hours earlier, and preload them into the system as flights in progress at the start of the day. Thus the events of a simulated day are treated as one complete cycle of a daily recurring sequence.

Since the Peak Day Tape gives only the departure time of a flight, the times of arrival at subsequent points are computed by using as ground speed the value reported for true airspeed. In a few cases this value is zero, so 500 knots is used instead. When the destination of the flight is the same airport from which it departed, a duration of one hour is assumed.

The boundaries of the control areas of the 21 ARTCC's are described to the computer by the coordinates of about 300 corner points. Latitudes and longitudes of the corners were scaled from the enroute high altitude US jet route wall planning charts of 3 April 1969 and were converted to x, y map coordinates. The problem of finding where a path of flight

crosses the boundary of a center is solved as follows. A new system of x, y coordinates is defined by shifting the origin of coordinates to the departure airport and rotating the axes until the positive x-axis points to the destination airport. The new y-coordinate of a point is thus its distance (positive to the left) from the path of flight. Given that the flight is in center area A, the new y-coordinate of each boundary point of A is computed point-by-point around the boundary in clockwise sequence. If two successive boundary points have new y-coordinates with opposite signs, then they lie on opposite sides of the flight path, so the path crosses the linear boundary segment between them. The crossing point is then easily computed. Because the shapes of the center boundaries are not necessarily convex, a straight path of flight may cross the boundary of one center 2,4, or more times. All crossings are found, but only the nearest one in the forward direction of flight is retained. The time of arrival at this point becomes the time of handoff to the next center. Of course, if the destination airport is nearer than the nearest boundary crossing ahead, then the flight will terminate without another handoff.

The curious irregularities of some center boundaries were doubtless introduced to put the crossings of busy airways in convenient places, but they introduce some adventitious crossings of the straight-line flight paths. For example, the line from New York's Kennedy Airport to Los Angeles International crosses from Indianapolis Center into Chicago, back into Indianapolis, and again into Chicago before reaching Kansas City.

3. Traffic Statistics

Before any code assignment plans were simulated, some runs were made to get statistics on how the traffic sample is distributed in time and space. Table 1 shows the number of departures from, handoffs to, and arrivals at each center area during the 24 hours. Appendix C gives for each center area and for each hour of the day the number of departures to each center area, the number of arrivals from each center area, and the number of handoffs from each adjacent center.

There are many small discrepancies on the order of 10 units between these data and corresponding data obtained later from the code plan simulation runs. These may be the result of taking the hourly data summaries about 3 seconds later in the flight statistics runs. Whatever their cause the discrepancies are much too small to affect any conclusions; therefore repeating runs in an attempt to get exact agreement was not considered worthwhile.

Table 2 shows the number of aircraft with beacon codes in each center on each hour during the day. The numbers include those aircraft that have been given a code because they will depart within a half hour. The total number of codes in use in the USA reached 2593 at both 20:00 and 21:00 GMT, while the number in the Chicago center reached 244 at 24:00 GMT. The maximum numbers of codes required will in general be reached within rather than on the hours. These maxima are given in Table 3. Chicago center needed 260 codes sometime between 23:00 and 24:00 GMT. Canada appears as a center because some straight-line flights between points in the USA pass over Ontario, although no flights originating or terminating in Canada were included.

Table 1. Operations by centers

Center	Departures from	Handoffs to	Arrivals at
Albuquerque	717	811	769
Atlanta	1688	1609	1651
Boston	1619	687	1434
Chicago	2701	2227	2746
Cleveland	2413	2753	2302
Denver	614	1058	601
Fort Worth	1675	1294	1674
Great Falls	265	155	276
Houston	1638	671	1592
Indianapolis	1520	1947	1474
Jacksonville	1162	1358	1108
Kansas City	1276	1262	1318
Los Angeles	1783	874	1764
Memphis	757	1228	826
Miami	905	463	884
Minneapolis	777	423	759
New York	2064	2596	2571
Oakland	1131	617	1168
Salt Lake City	301	502	305
Seattle	748	177	702
Washington	1938	1563	1768
Totals	27692	24261	27692

Table 2. Number of aircraft with beacon codes in each center on the hour

CENTER \ AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BOSTON	54	49	45	25	13	9	6	9	3	14	75	94	99	109	108	96	90	102	118	110	104	93	90	71
NEW YORK	100	89	51	46	51	28	13	8	16	18	84	155	167	189	174	151	141	140	151	169	159	156	156	120
WASHINGTON	112	71	58	19	28	19	7	11	7	24	47	117	164	190	174	167	157	149	184	161	146	135	129	128
JACKSONVILLE	75	60	46	46	21	13	13	8	11	13	8	34	59	138	134	116	132	116	148	145	143	131	122	113
MIAMI	31	39	52	32	20	17	9	8	7	4	18	37	76	87	59	66	64	85	95	78	80	76	58	60
CANADA	2	3	0	0	0	0	0	1	0	1	0	0	2	2	3	5	2	4	4	2	0	0	0	1
CLEVELAND	112	102	64	66	46	28	25	29	20	31	81	173	194	205	193	158	159	203	217	210	202	185	168	140
ATLANTA	123	92	54	51	42	20	13	10	16	14	18	51	111	115	122	137	155	156	159	172	167	172	141	139
INDIANAPOLIS	106	70	57	43	36	17	18	4	9	22	16	60	124	148	146	128	129	130	112	172	182	157	147	135
CHICAGO	171	143	103	141	64	35	29	39	31	31	25	51	148	189	215	189	186	207	200	227	201	233	233	244
MEMPHIS	52	51	39	24	23	9	11	7	4	6	14	39	61	85	100	96	95	80	84	90	102	87	90	61
HOUSTON	91	60	64	45	34	14	7	11	4	4	5	14	52	125	146	174	166	165	139	166	157	163	156	130
MINNEAPOLIS	30	23	32	17	11	8	8	4	6	8	19	39	78	62	59	58	68	61	69	53	49	51	59	58
KANSAS CITY	106	64	67	46	39	31	15	25	27	15	8	23	62	118	124	118	106	128	131	133	161	136	145	108
FORT WORTH	100	79	46	45	30	22	18	20	11	9	17	58	117	133	167	204	175	192	197	207	202	186	165	129
GREAT FALLS	12	12	8	10	54	53	15	31	28	19	19	6	3	5	10	17	22	24	11	12	20	24	10	14
DENVER	87	68	53	40	24	29	23	27	35	19	11	15	29	49	50	81	95	120	83	78	86	84	84	97
ALBUQUERQUE	60	63	58	43	35	21	22	19	14	14	11	8	11	27	79	106	101	94	97	99	122	120	93	90
SALT LAKE CY	34	39	29	24	24	11	9	12	6	11	12	5	4	7	25	36	57	48	46	36	47	41	37	39
SEATTLE	36	39	39	25	23	25	21	24	35	25	21	19	17	33	52	60	57	49	51	47	36	44	52	46
OAKLAND	77	91	63	56	42	36	25	13	8	11	4	6	18	52	93	114	126	86	91	85	77	71	84	96
LOS ANGELES	153	111	97	82	79	62	55	34	20	24	13	14	16	32	74	122	136	148	130	141	150	118	129	137
TOTAL	1724	1418	1125	926	739	507	362	354	318	337	526	1018	1612	2100	2307	2399	2419	2487	2517	2593	2593	2463	2348	2156

Table 3. Maximum number of aircraft with beacon codes in each center during each hour

CENTER \ GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MAXIMUM
BOSTON	75	59	57	46	25	14	14	9	9	14	77	97	104	115	116	110	100	116	122	132	116	115	100	92	132
NEW YORK	120	110	91	56	53	51	29	16	17	18	84	169	175	192	196	179	164	141	163	179	191	165	163	161	196
WASHINGTON	142	112	77	59	40	30	19	14	13	24	51	119	168	193	190	185	167	165	187	190	182	153	151	139	193
JACKSONVILLE	116	76	60	53	51	28	13	15	11	14	13	35	62	138	150	138	137	140	154	181	147	162	132	126	181
MIAMI	61	41	53	53	32	20	18	10	9	7	18	39	76	89	91	70	67	91	104	95	87	84	77	65	104
CANADA	4	4	4	1	1	1	0	1	2	1	1	3	2	6	6	5	5	5	7	6	3	2	7	7	7
CLEVELAND	153	126	104	67	75	50	29	34	32	31	81	185	198	214	205	196	170	209	217	218	212	205	198	173	218
ATLANTA	145	131	92	66	53	47	21	13	18	20	18	60	112	127	132	154	169	168	164	174	179	203	180	156	203
INDIANAPOLIS	139	111	79	60	61	36	27	21	11	23	24	61	125	155	170	149	135	135	142	174	183	189	169	152	189
CHICAGO	247	171	143	144	141	67	37	43	43	38	34	52	153	192	230	229	208	213	207	237	235	237	240	260	260
MEMPHIS	71	55	51	39	28	27	12	11	7	7	14	39	61	85	106	102	107	98	92	107	107	107	97	96	107
HOUSTON	130	93	69	64	47	34	16	11	13	7	8	14	52	125	165	174	192	176	176	167	171	172	176	158	192
MINNEAPOLIS	58	34	34	36	17	12	9	8	6	8	19	39	78	81	65	66	75	75	72	74	57	56	66	61	81
KANSAS CITY	121	113	79	76	46	40	31	28	27	29	16	24	63	122	135	137	124	129	139	148	165	170	147	146	170
FORT WORTH	130	100	84	55	49	33	22	26	20	11	21	60	117	141	168	206	209	193	206	208	228	209	186	166	228
GREAT FALLS	18	14	13	14	54	57	53	32	35	30	22	19	10	7	12	18	23	24	25	12	23	25	24	16	57
DENVER	108	90	69	57	40	29	29	27	42	35	21	15	29	53	54	83	101	124	120	85	98	97	89	98	124
ALBUQUERQUE	90	69	73	58	45	35	29	24	21	17	18	11	15	27	79	115	113	104	104	100	122	133	120	96	133
SALT LAKE CY	47	39	41	29	29	24	15	15	12	11	16	12	4	9	26	37	57	61	52	46	48	58	48	40	61
SEATTLE	52	53	39	41	32	25	25	26	37	37	30	25	22	35	54	63	72	67	51	57	51	47	54	54	72
OAKLAND	97	91	101	66	58	47	36	27	13	13	11	6	18	53	93	118	126	127	91	93	85	80	86	103	127
LOS ANGELES	160	153	119	105	84	83	63	60	35	31	26	18	20	32	79	127	139	159	150	150	179	152	131	139	179
MAXIMUM	247	171	143	144	141	83	63	60	43	38	84	185	198	214	230	229	209	213	217	237	235	237	240	260	260

To study the utilization times of codes one wants data on the distribution of the durations of flights. Flights that originate and terminate at the same airport are a special class, because they have been arbitrarily assigned a duration of one hour. In some code plans it is desirable to treat flights that originate and terminate in the same center area differently from flights that must be handed off because they originate and terminate in different center areas. For these two classes flights were tabulated by 10-minute intervals of duration from zero to 480 minutes. Figures 1 and 2 show the cumulative distribution curves for these two classes plotted with a normal probability scale for the cumulative percentage of flights and a logarithmic scale for the duration of flight. The near linearity of these curves shows that the distributions are approximately log-normal. Unfortunately 10 minutes is too long an interval to describe well the shorter flights within a single center area, but the only substantial departure from log-normality is that the flights within a single center area have too few flights of 120 minutes or longer duration. The flights that return to the same airport are counted here as having zero duration. Table 4 gives the means and some selected percentile points for these distributions.

4. Center Assignment Plan

In a center assignment plan each ARTCC has available to it the complete set of radar beacon codes. It keeps a record of which codes are in use within its control area, and it issues each originating flight an unused code. A flight coming into a center's control area from outside may retain its code if this code is not in use in this area. Otherwise its code is changed to an unused one. Thus

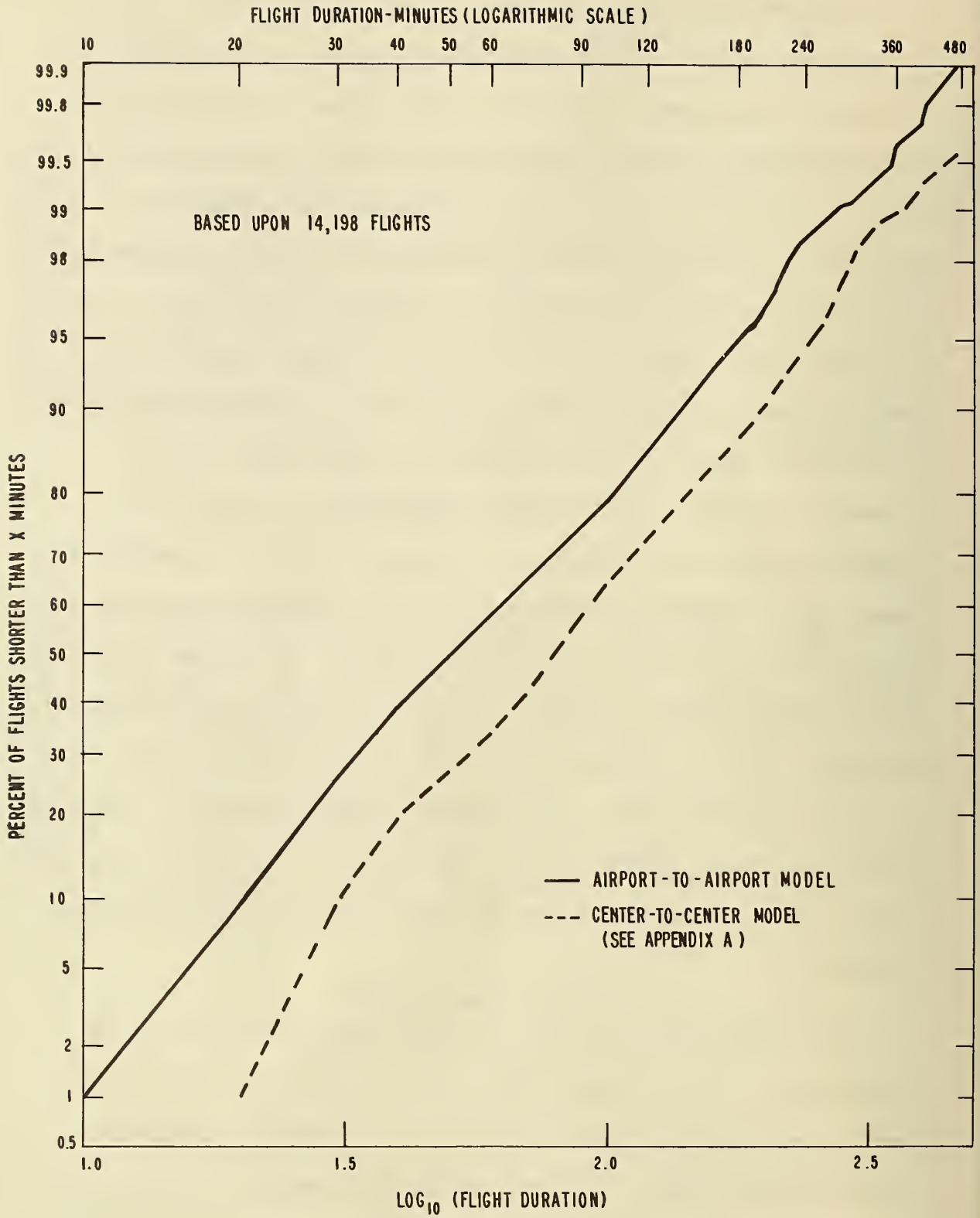


FIGURE 1. Duration of inter-center flights

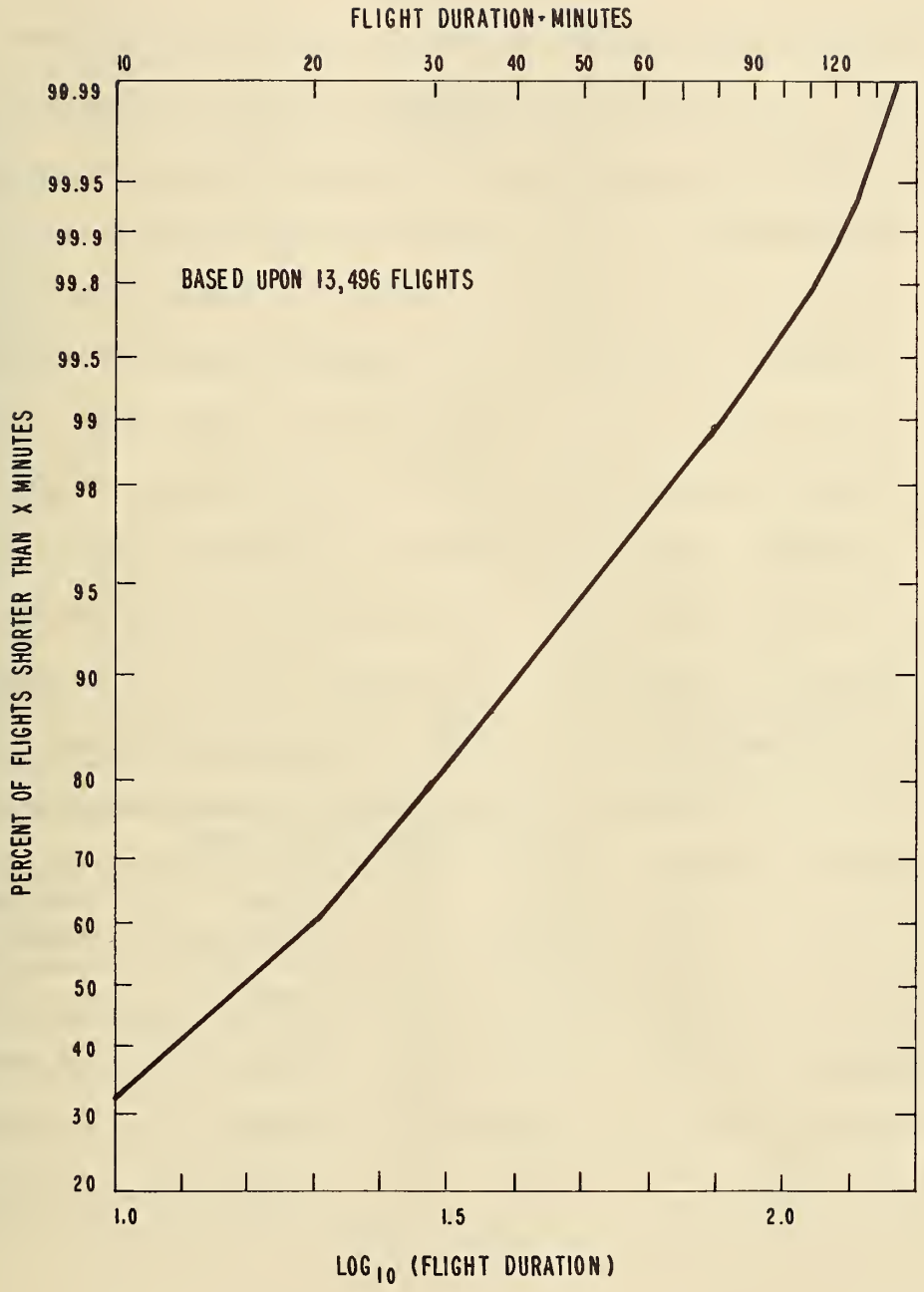


FIGURE 2. Duration of flights within the same center

Table 4. Distribution of duration of flights

	Within one center, minutes	Between different centers, minutes
Means:	20	68
Percentiles:		
1		10
10		20
25	8	30
50	16	50
75	27	77
90	40	139
99	81	275
No. of Flights	13,496	14,198

Table 5. Three center assignment plans, 25,646 flights, 800 codes

	Issue from top, return to bottom	Issue from top return to top	Issue by random selection
Handoffs	18,986	18,986	18,986
Code changes	3,200	10,976	2,469
Percent changes	17%	58%	13%

each center prevents duplication of codes within its control area, but use of the same code in different control areas is freely permitted. There is no communication between centers to reserve codes for extended flights.

The first suggestion for a center assignment plan required each center to keep a list of its codes that are not in use, to issue codes from the top of the list, and to return them to the bottom. An alternative is to return codes to the top of the list. In the preliminary phase of this project both these plans were simulated using a simplified model of air traffic movements that is described in Appendix A of this report. But neither plan performed as well as a third plan in which codes were issued in random sequence. The comparative results when 800 codes were available to each center are shown in Table 5.

At the start of simulation all 21 code lists were in the natural sequence 1, 2, 3,..... Because all centers began issuing the same codes, the probability of code conflict at handoff was high. When codes were returned to the bottoms of the lists, the code lists gradually became randomly shuffled so that performance tended toward that of the random plan. However, when codes were returned to the tops of the lists, no center could get further into its list than the maximum number of codes in use at one time. Most of each list was never used, and all centers continued using only the lowest numbered codes, so conflicts were frequent.

Another disadvantage of both plans that issue codes from a list or stack is that their implementation requires an excessive amount of computer memory. For 800 codes and 21 centers they require (800)(21) = 16,800 words. Each word contains two addresses, one pointing to the preceding code in the stack and one pointing to the succeeding code. An attempt to run the simulation with 1100 codes aborted with memory overflow. The random assignment plan needs only one bit for each code and each center to tell whether or not that code is in use in that center.

The idea behind the better-working random assignment plan is the following. Consider one aircraft coming into a new center. One wishes to minimize the probability that its code is in use in this center. But if the center had no prior knowledge of which particular code this aircraft is using, it could do no better than to make the probability of use equally small for all codes. In other words the codes in use should be randomly scattered throughout the space of available codes. When a code is needed, the computer makes a random draw from the whole complement of available codes by invoking a pseudo-random number generating routine. If this code is in use, another is drawn until an unused code is obtained.

Reflection on this plan suggested a further improvement. Recall that the traffic sample divides about equally between local flights that do not leave the center area in which they originate and nonlocal flights that terminate in other centers. The local flights can be served without any code conflicts at all if each center uses the same bank of only about 100 codes for them. The remaining, say 700, codes can then be used in the random assignment plan for the nonlocal flights.

Because there are almost as many codes available for many fewer flights, many fewer code changes will be required.

The particular code assigned to a local flight never has any effect in the simulation; therefore the program does not assign any codes to local flights. Instead it counts the number of local flights in progress (including those that will start within one-half hour) in order to learn how large a code bank needs to be reserved for local flights.

Table 6 shows the hour-by-hour and center-by-center results of simulating the center assignment plan using 700 codes for the nonlocal flights and issuing codes one-half hour before departure. The overall summary results are:

Handoffs	24,261
Actual codes changed	2,370
percentage	9.76%
Expected code changes	2,727
percentage	11.08%
Most local flights in one center	116

The numbers of code changes that actually occur are random variables. They are sums of the code changes that occur on individual handoffs and each of these depends on the particular "deal" of the random code assignments. At a particular handoff let n be the random variable that equals 1 if a code change is required and equals 0 if a change is not required. If p is the probability that a code change will be required, then the expectation value of n is

$$E(n) = 1 \cdot p + 0 \cdot (1-p) = p,$$

Table 6. Center assignment plan with 700 codes for inter-center flights assigned by random selection (3 pages)

CENTER	GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
ALBUQUERQUE																										
HANDOFFS TO		54	33	33	35	25	12	20	11	7	8	6	1	7	19	26	44	50	46	61	57	57	81	56	62	811
ACTUAL CODE CHANGES		1	3	1	2	1	0	1	0	0	0	1	0	0	0	2	2	3	3	5	6	1	9	9	1	51
EXPECTED CODE CHANGES		4	2	2	2	1	0	1	0	0	0	0	0	0	0	1	3	4	4	6	5	5	9	5	5	61
LOCAL FLIGHTS		18	19	19	13	9	8	5	2	3	3	2	0	0	13	39	62	56	38	35	37	48	50	44	37	
ATLANTA																										
HANDOFFS TO		110	55	33	60	50	23	15	11	12	8	10	16	54	96	110	86	90	103	91	132	102	130	102	109	1608
ACTUAL CODE CHANGES		12	11	2	3	1	1	0	0	1	0	0	1	1	9	13	8	11	10	10	24	18	19	13	15	183
EXPECTED CODE CHANGES		14	7	2	3	2	1	0	0	0	0	0	1	4	11	12	11	15	15	12	20	17	24	15	15	202
LOCAL FLIGHTS		41	39	37	25	14	6	7	3	3	3	6	20	16	45	49	50	45	57	59	61	58	61	57	54	
BOSTON																										
HANDOFFS TO		36	39	30	14	13	13	7	5	2	3	7	28	27	47	43	35	37	35	42	48	46	35	35	53	680
ACTUAL CODE CHANGES		3	0	3	0	0	0	0	0	0	0	0	2	0	3	0	0	1	2	4	0	5	1	2	5	31
EXPECTED CODE CHANGES		1	1	1	0	0	0	0	0	0	0	0	2	2	4	3	2	2	3	3	4	3	3	2	3	41
LOCAL FLIGHTS		42	26	34	27	12	6	4	4	5	9	39	43	38	61	62	58	56	60	67	66	54	50	53	45	
CHICAGO																										
HANDOFFS TO		140	104	67	57	57	39	24	37	31	41	31	29	78	112	122	108	128	149	133	154	125	149	149	164	2228
ACTUAL CODE CHANGES		27	14	10	6	3	3	0	1	0	4	1	2	9	15	13	15	20	16	30	26	19	29	22	31	316
EXPECTED CODE CHANGES		25	15	8	5	5	2	1	1	1	2	1	1	6	15	19	17	21	26	25	32	22	27	28	34	339
LOCAL FLIGHTS		86	59	53	62	63	24	11	9	9	5	4	21	21	90	109	102	85	82	74	86	86	98	98	99	
CLEVELAND																										
HANDOFFS TO		186	130	91	71	77	47	24	36	20	14	26	66	138	155	132	141	148	155	157	190	200	187	193	178	2762
ACTUAL CODE CHANGES		25	13	7	0	4	2	1	0	4	0	1	3	17	24	19	18	21	21	22	35	27	29	29	17	339
EXPECTED CODE CHANGES		27	16	7	4	5	2	1	1	1	0	1	9	24	30	24	25	24	28	30	35	38	35	35	28	429
LOCAL FLIGHTS		39	35	28	22	19	14	12	8	5	9	31	67	61	62	67	68	52	67	74	68	59	67	51	40	
DENVER																										
HANDOFFS TO		86	65	44	41	21	22	25	24	34	21	14	5	6	13	16	60	82	83	71	59	59	72	68	67	1058
ACTUAL CODE CHANGES		12	7	4	2	2	1	0	1	1	1	0	0	0	3	1	3	5	8	8	1	6	7	7	5	85
EXPECTED CODE CHANGES		10	6	3	2	1	1	1	2	1	0	0	0	1	1	4	8	10	9	5	5	7	6	7	7	89
LOCAL FLIGHTS		17	19	14	12	12	8	6	4	4	1	1	7	7	23	22	24	28	26	24	22	26	21	20	21	
FORT WORTH																										
HANDOFFS TO		71	63	51	45	30	30	9	13	10	7	13	11	12	32	58	81	93	86	85	84	93	109	111	97	1294
ACTUAL CODE CHANGES		6	4	1	2	1	0	0	1	0	0	2	0	0	4	2	9	11	5	7	10	9	18	13	11	116
EXPECTED CODE CHANGES		7	5	3	2	2	1	0	0	0	0	0	0	1	3	6	10	12	12	12	10	14	17	16	13	146
LOCAL FLIGHTS		52	34	32	16	10	6	7	9	5	2	5	29	28	80	90	111	116	87	108	106	115	99	82	65	
GREAT FALLS																										
HANDOFFS TO		12	9	8	9	4	1	2	3	5	3	1	4	1	1	5	11	18	12	5	6	11	7	6	11	155
ACTUAL CODE CHANGES		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
EXPECTED CODE CHANGES		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
LOCAL FLIGHTS		4	4	6	8	50	51	51	29	31	27	20	18	3	4	7	8	9	12	13	9	8	8	10	7	
HOUSTON																										
HANDOFFS TO		31	35	27	18	18	8	2	3	7	5	2	9	18	26	30	37	54	38	57	51	42	50	54	49	671
ACTUAL CODE CHANGES		0	3	0	1	0	0	0	0	0	0	0	0	0	1	3	2	3	2	4	1	2	6	2	2	32
EXPECTED CODE CHANGES		2	2	1	1	1	0	0	0	0	0	0	0	1	1	3	3	5	3	5	4	4	5	6	4	52
LOCAL FLIGHTS		65	49	40	35	23	11	6	7	5	2	3	4	4	72	96	101	115	115	107	96	98	98	102	84	
INDIANAPOLIS																										
HANDOFFS TO		119	72	62	34	66	39	24	16	16	33	20	30	84	94	121	98	105	107	118	156	141	123	123	134	1935
ACTUAL CODE CHANGES		14	5	6	1	1	1	0	0	0	0	0	0	6	9	18	7	12	14	14	26	24	19	17	20	214
EXPECTED CODE CHANGES		15	7	4	2	3	1	1	0	0	1	0	1	8	13	17	12	13	15	17	26	25	21	20	20	242
LOCAL FLIGHTS		42	36	21	22	20	7	4	1	0	0	2	15	15	53	66	57	48	43	43	51	53	55	56	53	
JACKSONVILLE																										
HANDOFFS TO		75	54	49	62	36	25	11	8	4	5	3	11	22	58	85	64	88	92	102	123	100	109	91	81	1358
ACTUAL CODE CHANGES		9	4	3	3	4	0	0	0	0	0	0	0	0	8	5	5	9	9	10	16	10	18	11	6	130
EXPECTED CODE CHANGES		8	3	3	4	2	0	0	0	0	0	0	0	1	6	9	7	9	10	12	18	12	17	11	10	143
LOCAL FLIGHTS		31	23	16	10	9	5	3	1	5	5	4	14	14	61	64	57	59	56	55	58	56	46	35	33	
KANSAS CITY																										
HANDOFFS TO		75	54	64	30	29	21	9	14	20	17	10	11	25	68	73	82	69	80	87	71	82	78	104	89	1262
ACTUAL CODE CHANGES		12	5	5	1	0	0	1	0	0	1	0	0	0	6	5	9	5	9	13	12	7	7	12	8	118
EXPECTED CODE CHANGES		8	5	4	2	1	1	0	0	0	0	0	0	1	6	8	9	6	7	10	9	11	9	13	11	122
LOCAL FLIGHTS		37	32	26	25	17	11	10	10	9	6	2	7	7	49	51	55	56	55	54	54	64	73	58	45	
LOS ANGELES																										
HANDOFFS TO		81	65	42	50	34	25	20	20	12	15	7	9	8	6	25	49	61	57	53	56	40	51	43	45	874
ACTUAL CODE CHANGES		15	7	2	2	1	2	0	2	1	0	0	0	0	0	1	1	3	5	6	4	5	8	0	4	69
EXPECTED CODE CHANGES		10	8	3	4	2	1	1	1	0	0	0	0	0	0	1	4	6	7	5	6	5	5	4	5	79
LOCAL FLIGHTS		64	59	50	48	38	38	26	14	7	8	11	11	8	22	42	67	59	81	81	61	87	77	62	67	
MEMPHIS																										
HANDOFFS TO		67	63	37	32	35	22	12	7	8	6	9	11	33	58	79	81	91	89	83	73	101	67	90	74	1228
ACTUAL CODE CHANGES		5	3	1	1	0	2	0	0	0	0	0	1	0	0	9	8	11	5	6	7	8	7	8	9	91
EXPECTED CODE CHANGES		4	3	2	1	1	1	0	0	0	0	0	0	1	4	8	8	10	8	8	8	11	7	9	7	101
LOCAL FLIGHTS		15	13	7	4	4	3	3	3	2	0	3	24	24	25	29	27	26	26	20	24	25	29	20	17	
MIAMI																										
HANDOFFS TO		36	25	31	18	12	18	5	5	3	3	0	4	8	8	20	34	32	28	33	34	26	28	20	32	463
ACTUAL CODE CHANGES		3	0	2	0	0	0	0	0	0	0	0	0	0	1	2	0	5	0	4	3	0	1	0	3	24
EXPECTED CODE CHANGES		2	1	1	1	0	0	0	0	0	0	0	0	0	0	1	2	1	2	3	3	2	2	1	2	25
LOCAL FLIGHTS		17	22	20	13	10	6	6	5	5	4	15	31	30	45	42	33	33	34	37	32	34	29	27	18	
MINNEAPOLIS																										
HANDOFFS TO		22	19	23	17	14	9	4	6	6	6	5	0	6	13	35	27	25	31	30	20	24	24	27	30	423
ACTUAL CODE CHANGES		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	2	2	1	9
EXPECTED CODE CHANGES		1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	1	1	1	1	1	1	15
LOCAL FLIGHTS		19	12	12	15	12	9	6	4	2	3	9	22	22	59	41	33	35	37	37	41	27	28	36	35	
NEW YORK																										
HANDOFFS TO		126	127	85	52	57	37	18	18	29	15	33	104	148	158	143	150	152	116	148	183	195	174	168	164	2600
ACTUAL CODE CHANGES		11	15	10	4	2	0	1	0	0	0	2	9	20	28	18	26	19	26	28	25	29	25	29	28	335
EXPECTED CODE CHANGES		14	14	7	2	3	1	0	0	0	0	1	14	26	28	24	24	23	14	25	33	37	32	31	27	384
LOCAL FLIGHTS		29	22	21	20	10	9	5	2	0	8	34	45	40	64	66	63	52	42	39	39	42	35	27	33	
OAKLAND																										
HANDOFFS TO		38	65	47	37	28	32	15	11	5	10	5	4	6	2	12	18	34	34	23	39	30	38	41	39	617
ACTUAL CODE CHANGES		2	3	1	3	0	0	1	1	0	0	0	0	0	0	1	3	0	1	2	2	2	0	4	2	28
EXPECTED CODE CHANGES		2	5	3	2	1	1	0	0	0	0	0	0	0	0	1	2	3	2	1	2	2	2	3	3	36
LOCAL FLIGHTS		42	35	47	32	30	17	9	6	3	3	2	2	2	35	41	57	76	70	46	51	42	30	33	43	
SALT LAKE CY																										
HANDOFFS TO		37	23	25	25	18	9	8	10	10	8	4	5	3	5	21	32	56	42	25	18	22	37	35	24	502
ACTUAL CODE CHANGES		0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	2	2	0	1	0	1	0	1	10
EXPECTED CODE CHANGES		1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	1	2	1	1	18
LOCAL FLIGHTS		15	10	12	7	6	7	4	3	3	4	6	5	2	3	8	11	9	15	18	20	20	22	17	15	
SEATTLE																										
HANDOFFS TO		10	11	14	11	11	9	2	1	2	2	3	3	1	1	4	6	10	17	15	6	4	14	10	10	177
ACTUAL CODE CHANGES		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	0	5
EXPECTED CODE CHANGES		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
LOCAL FLIGHTS		31	32	24	19	17	17	16	21	31	32	25	22	15	25	35	33	38	43	34	40	31	27	25	29	
WASHINGTON																										
HANDOFFS TO		112	50	52	30	52	20	11	14	8	8	11	32	72	94	77	118	87	75	110	105	113	102	102	100	1555
ACTUAL CODE CHANGES		21	3	3	0	0	0	0	0	0	0	0	1	15	15	10	20	10	11	19	6	19	19	6	5	183
EXPECTED CODE CHANGES		14	4	3	1	2	0	0	0	0	0	0	3	9	14	11	18	12	11	16	17	17	14	16	13	197
LOCAL FLIGHTS		44	36	26	22	8	5	4	4	1	11	26	37	36	81	86	79	58	59	77	69	62	56	35	39	

and the variance of n is

$$\sigma^2 = E(n-p)^2 = (1-p)^2 p + (0-p)^2 (1-p) = p(1-p).$$

When independent random variables are added, their expected values and variances are additive; therefore, if i denotes the i-th handoff, the expected number of code changes is

$$E(\Sigma n_i) = \Sigma p_i,$$

and the variance of the number of code changes is

$$\sigma^2 = \Sigma p_i (1-p_i).$$

If the p_i tend to be about 0.1, then the factors $(1-p_i)$ are about 0.9, so the variance is about 0.9 times the expected number, and the standard deviation is about 0.95 times the square root of the expected number. Thus, if the number of code changes expected in a particular center during a particular hour is 4 one should not be at all surprised to actually observe any number in the range 4±2.

Because the sampling variations are so large, one would like to obtain from the simulation some more stable estimate of the number of code changes to expect. If the codes in use in a center are distributed independently of the code of an incoming aircraft, then the probability that a code change will be required in just

$$p = \frac{A}{C}$$

where A is the number of codes in use in the center and C is number of codes in the code bank. Probabilities computed in this way were accumulated to obtain the numbers called "expected code changes" in the tables of results. The numbers of actual code changes are almost always smaller than the "expected code changes" and the total of the actual code changes, 2370, is less than the expected 2727 by about 7

standard deviations. The thing that is wrong is the assumption that all the codes in use in the center are distributed independently of the code of the entering aircraft.

To see how the assumption of independence may fail to be satisfied, consider a particular flight, say, UA411 entering the Chicago center area from Cleveland. A few aircraft now in the Chicago center may have been in the Cleveland center area while UA411 was there. The codes of these aircraft are certainly not the same as UA411's code because Cleveland would not allow a conflicting code assignment. The true probability that UA411's code will have to be changed is

$$p = \frac{A-N}{C-N}, \qquad (1)$$

where N is the number of aircraft with these nonindependently assigned codes. Subtracting N from the numerator and denominator gives a smaller probability of change. Unfortunately there is no practical way to know the value of N at each handoff and so to compute the true expected numbers of code changes. However, as a first approximation to removing the erroneous bias, one can multiply each number reported under "expected code changes" by the factor $2370/2727 = 0.87$.

If the traffic doubles in numbers and we wish to keep the same probability of code change at each handoff, then eq. (1) shows that we have to double the size of the code bank; i.e.

$$p = \frac{2A-2N}{2C-2N} = \frac{A-N}{C-N}.$$

Of course the total number of handoffs doubles, and the total number of code changes doubles.

The following variation on the random assignment plan was suggested with a view toward minimizing code changes in flight. It uses 2800 codes for inter-center flights, divided into four banks of 700 codes each. The four banks are assigned to centers like four colors to a map; i.e., center areas with a common boundary use different banks. Furthermore it is attempted to avoid repeating the same bank along heavily traveled routes. If the banks are called A, B, C, and D, they are assigned to centers as follows:

D	Albuquerque	C	Kansas City
A	Atlanta	B	Los Angeles
A	Boston	D	Memphis
A	Chicago	D	Miami
C	Cleveland	D	Minneapolis
B	Denver	B	New York
A	Fort Worth	B	Oakland
C	Great Falls	A	Salt Lake City
B	Houston	D	Seattle
B	Indianapolis	D	Washington, D.C.
C	Jacksonville		

The device of using four banks assigned as above was compared by simulation with the use of 2800 codes in a single bank. The results are as follows:

Total handoffs	24,261
Expected code changes	681
percent	2.80%
Actual code changes (1 bank)	507
percent	2.09%
Actual code changes (4 banks)	310
percent	1.28%
Ratio: 507/310	1.63

Thus it appears that there is an advantage of 1.6 times in the use of four banks in non-adjacent assignments. However, one caution should be noted: if traffic increases by three times, a busy center will contain more than 700 flights in the peak hour. This may still not exhaust the code bank if enough of these flights have codes in other banks because they originated outside this center.

Let us discuss this problem a little further. At most 2618 aircraft have codes at one time, and only somewhat more than half of these are flying between different centers, so 2800 codes are more than enough to give each inter-center flight a unique code. Suppose each center were given a unique code bank proportional to its busy hour departures. Then at this level of traffic every inter-center flight would get a unique code. But when the traffic becomes great enough to exhaust some center's code bank, what code should it issue? It could make a random selection from outside its own code bank, but it just might select a code of its neighboring center into which the flight is about to go. Clearly it would be better to use a code of some remote center. Or better yet, it might consult the flight plan of this aircraft

and use a code from some center remote from any in which this aircraft will fly. Randomization is not an optimum policy when it ignores relevant information.

Now suppose traffic increases much further; say it reaches two or three times the level that each center can accommodate from its own code bank. Now no center really knows what codes any other center is issuing. In this case the random assignment strategy actually becomes optimum.

So at low traffic densities unique code banks are optimum and at very high densities random selection is optimum. It is at intermediate densities that an optimum procedure is complicated and further study is needed.

5. Master Assignment Plan

In a master assignment plan one master control center assigns radar beacon codes for all IFR flights in the United States. All flight plans are sent to the master center, and this center is notified of every handoff and every arrival so that it can update its file of codes in use. With all this information the master center can assign codes so that no two aircraft in the same ARTCC control area ever have the same code. Thus no one is required to change his code in flight unless there is a diversion, or a flight plan is changed in flight.

By issuing the same code to different flights whenever they will not enter the same center area, the master center can try to minimize the number of codes required. The simulation to be described found that 465 codes suffice for the 27,692 flights of the peak day's IFR traffic.

The master center keeps track of which codes are in use in each ARTCC. When a flight plan is filed, in this model 30 minutes before departure, the master center first determines in which centers this flight will fly. Then it finds the first code that is not in use in any of these centers and reserves that code for the flight.

This process is accomplished in the computer simulation by reserving one computer word for each code. Within that word each center has its own corresponding bit position in which a 1-bit signifies that that code is in use in that center. When a flight is handed off from a center or terminates in a center, the corresponding 1-bit is reset to 0.

While analyzing a flight plan the computer generates a mask word that contains a 1 in the bit position of every center in which the flight will fly. It then uses this mask to test the memory words of code number 1, then number 2, and so forth until it finds the first word that has 0's everywhere that the mask has a 1. Each of these 0's is changed to a 1, and the corresponding code is assigned to the flight.

It may seem wasteful to reserve a code in Los Angeles 30 minutes before the flight will depart from New York, but in order to let some other aircraft use that code in Los Angeles before the flight from New York arrives, one would have to keep track of code reservations by blocks of time. This would multiply the records that must be kept by the number of time blocks used and would correspondingly increase the time spent in searching them. The saving in codes that might result does not seem worth the greater complication of the system.

Table 7 gives the results of simulating the master assignment plan. The number of aircraft with codes reached 2618 in the hours 20:00 to 22:00 GMT, and the highest code in use reached 465, so on the average each code was serving over 5 1/2 aircraft.

To achieve its virtues of no code changes in flight and great economy in code use, the master assignment plan requires many communications to the master center. It would save 24,261 messages on the peak day if the master center were not notified of handoffs. A code would then remain reserved in every center area that a flight flies over until the flight ends. Table 8 shows that this scheme increases the number of codes needed from 465 to 547, which seems a very modest increase considering the communications saved.

One may now ask how many more codes are necessary if the level of traffic doubles. Suppose that these added aircraft are called blue aircraft and that they are served from a second code bank called blue codes. Clearly the blue code bank will have to be the same size as the original code bank, since it serves the same number of aircraft. Thus the number of codes required is no more than twice the original number. If the blue codes are appended to the end of the original bank and the combined bank is treated as one, then when the computer is seeking a code for a blue aircraft it will first scan the original codes, and sometimes it will find one of them available. The increased scanning of the original codes will result in their being used more densely, and so not all the blue bank will be needed. However, it would require additional simulation with a larger traffic sample to find how much slower than linear is the growth of the number of codes required.

Table 7. Master assignment plan with codes returned at each hand-off

Hour GMT	On the hour		Maximum during preceding hour	
	Aircraft with codes	Highest code in use	Aircraft with codes	Highest code in use
1	1694	463	2161	465
2	1397	463	1726	463
3	1105	459	1420	463
4	913	459	1126	459
5	732	326	926	459
6	502	326	740	326
7	358	326	507	326
8	354	326	380	326
9	318	233	360	326
10	329	165	332	233
11	512	165	521	165
12	1021	303	1040	303
13	1612	341	1612	341
14	2101	388	2101	388
15	2272	392	2328	392
16	2368	409	2454	409
17	2380	409	2480	409
18	2456	428	2485	428
19	2480	454	2547	454
20	2550	463	2599	463
21	2542	460	2618	463
22	2431	460	2618	460
23	2321	465	2465	465
24	2137	465	2350	465

Table 8. Master assignment plan with codes returned only at arrival

Hour GMT	On the hour		Maximum during preceding hour	
	Aircraft with codes	Highest code in use	Aircraft with codes	Highest code in use
1	1694	530	2161	545
2	1397	530	1726	530
3	1105	530	1420	530
4	913	530	1126	530
5	732	492	926	530
6	502	492	740	492
7	358	492	507	492
8	354	492	380	492
9	318	288	360	492
10	329	184	332	288
11	512	184	521	184
12	1021	327	1040	327
13	1612	395	1612	395
14	2101	454	2101	454
15	2272	470	2328	470
16	2368	485	2454	485
17	2380	491	2480	491
18	2456	510	2485	510
19	2480	529	2547	529
20	2550	537	2599	537
21	2542	547	2618	547
22	2431	545	2618	547
23	2321	545	2465	545
24	2137	545	2350	545

Table 9. Flights of regional airlines in the 21 centers

M=Many flights F=Few flights Blank=No flights	Air West	Allegheny	Frontier	Mohawk	North Central	Ozark	Piedmont	Southern	Trans Texas
Albuquerque	F		M						M
Atlanta							M	M	
Boston		M		M					
Chicago		M	M		M	M	F		
Cleveland		M		M	M	F			
Denver	F		M		F	F			F
Fort Worth			M			F		F	M
Great Falls	F		M		F				
Houston								M	M
Indianapolis		M				M	M		
Jacksonville							M	M	
Kansas City		F	M		F	M		F	
Los Angeles	M		F						F
Memphis		F	M			M	M	M	M
Miami									
Minneapolis				F	M	M			
New York		M		M		F	F		
Oakland	M								
Salt Lake City	M		M						
Seattle	M								
Washington		M		F		F	M		

6. Airline Assignment Plan

"Basic Concept--Each airline is allocated a block of codes which it in turn assigns. Airlines whose routes do not cross or overlap may be allocated the same codes. Non air carrier aircraft will be assigned codes by the FAA," from "Modeling Objectives Pertaining to ATCRBS Code Utilization Model," Project 150-534, October 11, 1968, Federal Aviation Administration, Systems Research and Development Service, Systems Analysis Division.

We take "whose routes do not cross or overlap" to mean "whose routes do not enter the same center area." If such airlines are to be found, they are surely among the regional air carriers. Inspection of a route map for nine regional airlines yielded the data in Table 9. The distinction between many and few flights in a center area is rather subjective, but it was made in the hope that special treatment of a few connections such as Trans Texas from Albuquerque to Los Angeles would eliminate a number of overlaps. In Table 10 an M is entered between two airlines if there is any center area in which both have many flights. An F is entered if in every center area in which both have flights, one or the other has few flights. Finally a 0 means there is no center area in which both have flights. To see which airlines may use the same code bank the data in Table 10 are transformed into compatibility diagrams in Figure 3. Lines in Figure 3a connect airlines that have 0 between them in Table 10. Three airlines, Air West, Mohawk, and Southern are connected in a triangle which indicates that they can share the same code bank with no conflicts. But then the remaining six airlines must each have its own code bank, because

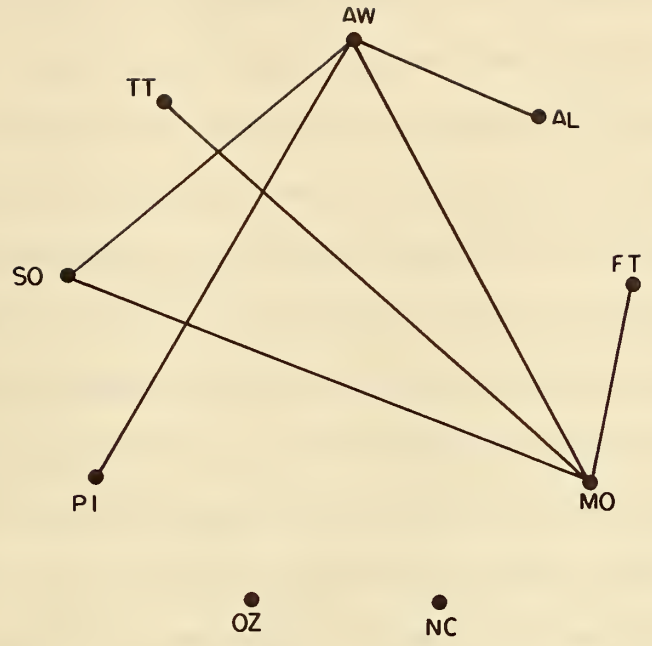
Table 10. Use of same centers by regional airlines

	Air West	Allegheny	Frontier	Mohawk	North Central	Ozark	Piedmont	Southern	TransTexas
Air West		0	M	0	F	F	0	0	F
Allegheny	0		M	M	M	M	M	F	F
Frontier	M	M		0	M	M	M	M	M
Mohawk	0	M	0		M	F	F	0	0
North Central	F	M	M	M		M	F	F	F
Ozark	F	M	M	F	M		M	M	M
Piedmont	0	M	M	F	F	M		M	M
Southern	0	F	M	0	F	M	M		M
Trans Texas	F	F	M	0	F	M	M	M	

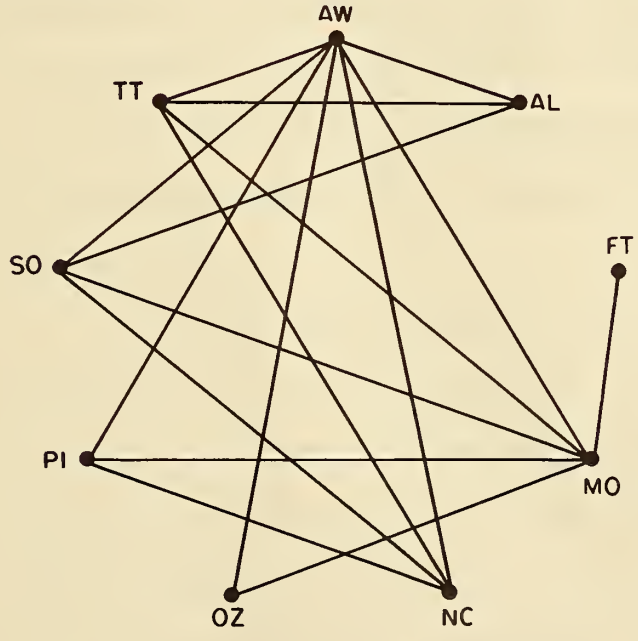
M = Many flights

F = Few flights

0 = No flights



(a) COMPATIBLE WITH NO CONFLICTING FLIGHTS



(b) COMPATIBLE WITH FEW CONFLICTING FLIGHTS

FIGURE 3. Regional airlines that could share a code-bank

there is no compatible pair independent of the first three. Alternatively the same number of code banks, seven, will suffice if Air West shares with Allegheny, Piedmont, or Southern, and Mohawk shares with Frontier, Soutern (if Air West does not), or Trans Texas.

In Figure 3b airlines are connected if they have either a 0 or an F between them in Table 10. This diagrams the relaxed relationship of "compatibility except for a few flights". If four airlines were able to use the same code bank, they would be connected in a quadrilateral complete with both diagonals, but there is no such configuration in Figure 3b. There are nine triangles but every one contains Air West, so only one group of three airlines can use the same code bank. After choosing the three, one can find two independent pairs, then the remaining two airlines must have their own code banks. Five code banks are required in all. Alternatively four pairs and one singleton can be found.

Considering that this plan takes care of only nine of the airlines and leaves both the other airlines and all of general and military aviation to use other code banks, one sees that the search for airlines that can use the same code bank is not very profitable.

A more promising approach is to preassign codes to all scheduled airline flights. The algorithm used in the master assignment plan, described in Section 5, could make these assignments with a nearly minimal number of codes. The value found there, about 5 1/2 concurrent flights per code, would probably be achieved, except that some allowance must be made for delays. If most delays would be covered by a 30 percent extension of the scheduled flight duration, then about 30 percent more codes would be needed. To incorporate schedule changes the preassignment algorithm should be rerun perhaps once a month. Advantages of preassigning codes are the reduction of communications to obtain and to release codes and the convenience of each scheduled flight's using the same code every day. Newly scheduled flights and flights that are excessively delayed can be assigned codes in the same fashion as nonscheduled flights.

7. Altitude Strata Assignment Plan

"Basic Concept--Codes will be assigned on the basis of aircraft being within certain altitude layers which may be compatible with the 64 code assignment scheme. In addition, certain codes will be used for climb and descent indications." Ibid.

If altitudes are partitioned into layers and the code-banks are partitioned in proportion to the populations in these layers, then the center assignment plan or the master assignment plan will work just

as well in each layer as it does in the unpartitioned system. But why do that? First, it does not save any codes because different code banks must be used for different layers. Second, the semi-automatic system has other means to obtain and retain altitude information and displays it right alongside the target symbol. Third, the 64-code assignment scheme is not really compatible with this or with any discrete code plan.

The 4096-code system uses the beacon code as a unique identifier of an individual aircraft, whereas the 64-code system like its parent the IFF system uses the code to signify membership in a class. The decoder on the controller's display can select for display any 10 out of 64 classes defined by two of the four octal digits in the reply. Because these classes are arrival, departure, high altitude sector, etc., an aircraft must necessarily change codes as it passes from one phase of flight to another. During the interim when the semi-automatic traffic control system with 4096-code capability is used in some parts of the country, and the manual system with only 64-code capability is used in others, it would seem simplest to accept a code change at handoff from one system to the other.

To a limited extent the schemes can be superimposed. The other two octal digits allow 64 discrete codes to be associated with each code in the 64-code system. If there are no more than 64 aircraft in an arrival, departure, or high altitude sector, then each can have a discrete code. But what is the purpose of this unless the aircraft are simultaneously under the surveillance of two observers, one with 4096-code capability and one with only 64? Sixty-four codes is hardly

a large enough number for feeding into a 4096-code system, and the identity is changed on handoff, say, from departure to high altitude sector. The two systems are just different enough to be incompatible.

8. Directional Assignment Plan

"Basic Concept--For example, north/south flights on the west coast, midwest, and east could use the same codes since the flights will not run together. In general, flights which do not share a common center could use the same codes." Ibid.

The last sentence quoted is a basic objective of the algorithm for the master assignment plan described in Section 5. Partitioning the country into groups or tiers of centers will not make this plan work any better and may make it work a little worse by introducing extra constraints. On the other hand partitioning can make the random assignment plan work a little better.

Suppose the country is divided into n parts such that a fraction q of the flights extends into more than one part while a fraction (1-q)/n flies within each part. If the same ratio of codes to aircraft is to be retained, a fraction q of the original codes is needed for the extended flights and a fraction (1-q)/n for the local flights.

Two cases yield values:

n	q	fraction of original codes needed q+(1-q)/n
2	1/3	2/3
3	1/2	2/3

It appears that for reasonable numbers the improvement is significant but not spectacular because it is difficult to find divisions with n large without having q large.

The directional corridors are hopefully such a division. But in thinking about air traffic it is easy to think mostly about the long nonstop flights such as New York to Los Angeles or Boston to Miami. It is easy to forget that these are a very small fraction of all the flights. Most flights are much shorter and may be more randomly distributed in direction. For this reason it may be better to group centers into nearly round clumps rather than into long, narrow strips. Because intuition is such a poor guide, it might be worthwhile to count the flights on the peak-day tape that stay within several different partitions of the centers. However, the results might be changed considerably if the scheduled airline flights were taken out by preassigning their codes.

In summary, one can study this plan further, but the results will have a specialized applicability and the benefits will be limited.

9. Fixed Code Assignment Plan

"Basic Concept--Each air carrier aircraft receives a unique code when it enters the commercial service. This code is not changed no matter where the aircraft goes in CONUS. The remaining aircraft are assigned codes under one of the other plans such as 'Center Assignment'." Ibid.

The only question about this plan is whether it is feasible to have so many codes reserved for this one purpose. Projections of the air carrier fleet[1] are

1968	1980	1995
2452	3600	6700

[1] Wallace L. Ashby, "Future demand for air traffic services," Proc. IEEE vol. 58, pp. 292-299; March 1970.

10. Summary

Simulations of two assignment plans for radar beacon codes show that the 1969 level of IFR traffic in the USA can be served with only 500 to 800 codes. With these plans the same grade of service for twice as much traffic will require twice as many codes. The two assignment plans are quite different because they satisfy very different constraints in the code handling system. Neither plan is optimum in the sense of giving the best performance possible under the constraints it assumes, but each is rather simple and so establishes a level of performance that can be achieved without much complication.

Table 11 gives comparative results for two variations of each plan. The master assignment plan uses three or four communications with the master center per flight, but requires no code changes in flight and uses the fewest codes. The center assignment plan uses no communications with a master center but requires nearly one code change for every ten handoffs when only 816 codes are used (116 codes are for flights that stay within a single center's area). Using 2916 codes and in particular using different banks in adjacent centers reduces the code changes to only one in 810 handoffs.

A good code assignment plan will probably incorporate features from various simple plans. For example one might include the following:

1. Scheduled air carriers have codes preassigned by the algorithm of the master assignment plan.
2. A single bank of about 100 codes is used by all centers for flights that do not leave that center area.

Table 11. Comparison of code assignment plans

	Master assignment plan		Center assignment plan	
	Codes released at handoff	Codes retained at handoff	1 bank of 700 codes	4 banks of 700 codes
Codes required	465	547	816	2916
Messages to/from master center	79,645	55,384	0	0
Code changes in flight	0	0	2,370	310

General data: Total flights 27,692

Handoffs between centers 24,261

Aircraft with codes, max. 2,618

3. The remaining codes are divided into unique banks allocated to the different centers in proportion to their traffic.

4. The algorithm to be used when this unique bank is exhausted is subject to further development, but for a start one might try a random choice from the banks of those centers that are not adjacent to the center issuing the code.

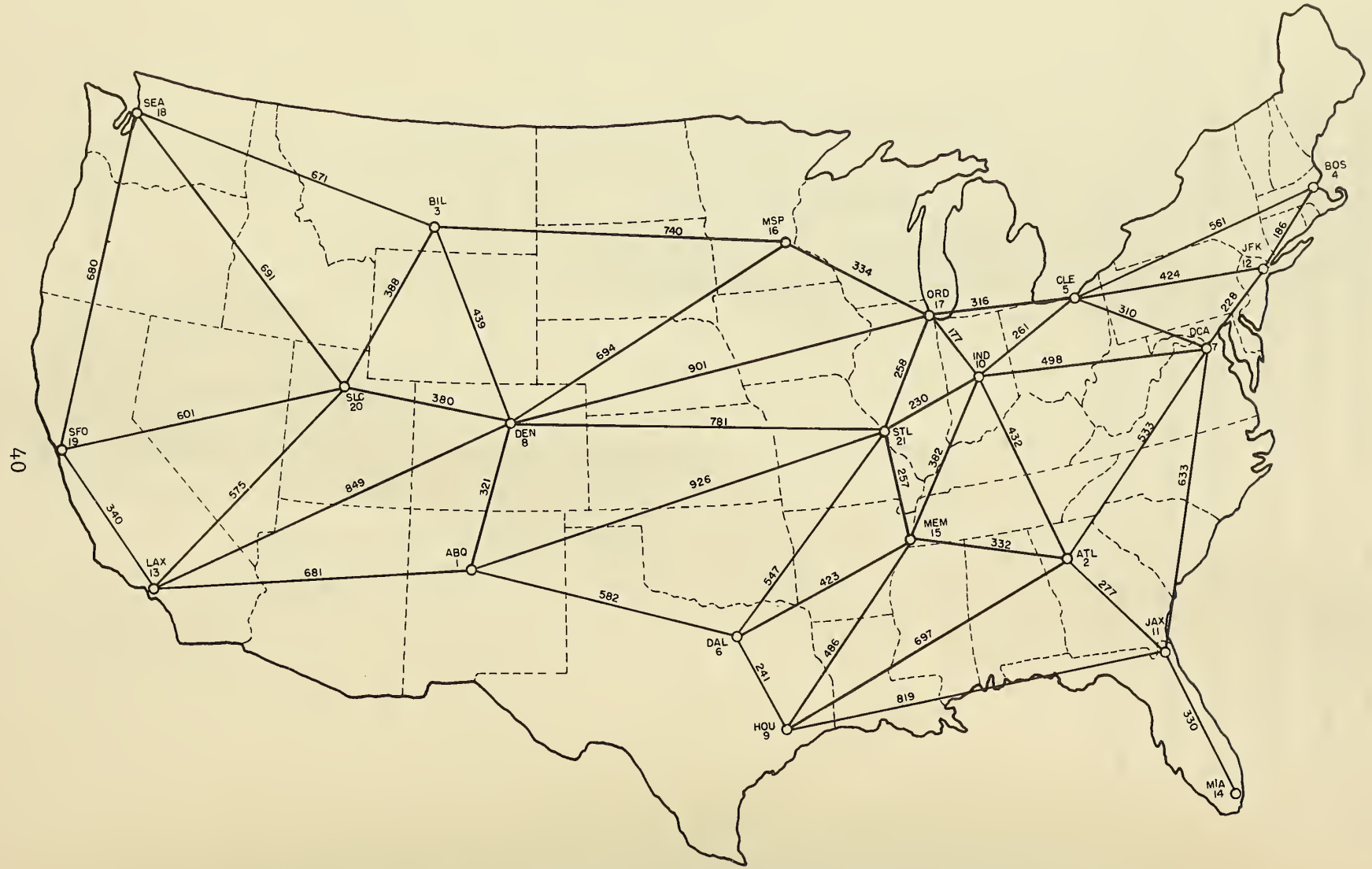


Figure 4. Route map between the 21 airports. Distances in statute miles.

Appendix A

Center-to-Center Flight Model

At the start of this project, i.e. in Phase I, it was apparent that quite a lot of clerical work would be necessary to put into machine usable form the data required to simulate flights along straight paths from airport to airport with handoff of control at each crossing of a center boundary. One had to look up the latitude and longitude of each airport and of each corner of a center's boundary then convert all these into x, y coordinates in a suitable map projection. It was desired to get preliminary simulation results on some assignment plans before all this was done. The scheme invented for doing this is called the "center-to-center flight model".

In this model just one airport is assumed in each of the 21 air route traffic control areas. All flights originating or terminating in a control area are assumed to originate or terminate at this one airport. Moreover all flights between adjacent control areas are assumed to follow a straight line between their respective airports. Figure 4, a map of the U.S., shows these 21 airports and the 44 paths between the airports of adjacent centers. Longer flights are assumed to follow a shortest path through this network. Handoff between centers is performed at the midpoint of each connecting path. Flight duration is just the distance divided by the speed except that flights within a single center area are given arbitrarily a duration of one hour.

In Phase II of the project, when the airport-to-airport model was introduced, it became apparent that the two models give rather different results. Figure 1, on page 12, shows by the dotted line the

distribution of durations of flights between different centers under the center-to-center model. This roughly parallels the curve for the airport-to-airport model, but there are fewer very short flights, and the overall average duration is 31 minutes longer. Average duration for the airport-to-airport model is 68 minutes, and for the center-to-center model it is 99 minutes. When one adds to each the 30 minutes that codes are issued before departure, the result is that about 32 percent more inter-center flights have codes at any time.

Another notable difference between the models is that 20,776 handoffs occur in the center-to-center model and 24,261 in the airport-to-airport. There appear to be two reasons for the difference. Even though two centers have a boundary segment in common, a straight line between a point in one and a point in the other may go through part of a third center. In the center-to-center model hand-off would be directly between the first two rather than via the third. The second reason is that the boundaries of the centers are not convex. A straight line may cross the boundary of the same center four or more times instead of just twice. The straight-line flights of the airport-to-airport model are probably a little worse in this respect than the actual routes of the airways, but the number of hand-offs in the airport-to-airport model is probably more realistic than the number in the center-to-center.

The Phase I traffic sample was analyzed to see how many flights remained within one center area and how many of those returned to the same airport. This analysis was not repeated in Phase II, because the results are not dependent on the model used. Tables 12-14 give the results from Phase I. These show that of all flights 48 percent stay within one center and 8.9 percent return to the same airport.

Other results from the center-to-center model are not tabulated here, because the corresponding results from the airport-to-airport model are considered more realistic.

Table 12. Analysis of local flights

Flights with origin and destination in the same center

Center	General Aviation	Air Carrier	Military	Total
Albuquerque	13	86	224	323
Atlanta	232	389	92	713
Great Falls	16	54	94	164
Boston	321	267	84	672
Cleveland	456	516	34	1006
Fort Worth	152	268	364	784
Washington	169	361	240	770
Denver	68	222	8	298
Houston	299	339	385	1023
Indianapolis	235	317	99	651
Jacksonville	75	122	182	379
New York	354	279	53	686
Los Angeles	395	397	180	972
Miami	82	219	120	421
Memphis	53	169	64	286
Minneapolis	105	210	91	406
Chicago	468	701	76	1245
Seattle	134	267	106	507
Oakland	98	232	121	451
Salt Lake Cy	39	67	7	113
Kansas City	175	236	88	499
Total	3939	5718	2712	12369

Table 13. Analysis of local flights

Flights with origin and destination airports the same

Center	General Aviation	Air Carrier	Military	Total
Albuquerque	1	3	204	208
Atlanta	22	2	54	78
Great Falls	1	1	87	89
Boston	14	8	55	77
Cleveland	13	2	30	45
Fort Worth	27	2	319	348
Washington	5	2	125	132
Denver	11	6	5	22
Houston	25	6	296	327
Indianapolis	3	0	83	86
Jacksonville	11	4	109	124
New York	8	7	16	31
Los Angeles	4	19	59	82
Miami	2	4	92	98
Memphis	5	5	39	49
Minneapolis	13	1	85	99
Chicago	31	9	50	90
Seattle	22	0	80	102
Oakland	4	3	102	109
Salt Lake Cy	9	0	7	16
Kansas City	7	3	58	68
Total	238	87	1955	2280

Table 14. Analysis of local flights (concluded)

Flights within one center with different origin and destination airports

Center	General Aviation	Air Carrier	Military	Total
Albuquerque	12	83	20	115
Atlanta	210	387	38	635
Great Falls	15	53	7	75
Boston	307	259	29	595
Cleveland	443	514	4	961
Fort Worth	125	266	45	436
Washington	164	359	115	638
Denver	57	216	3	276
Houston	274	333	89	696
Indianapolis	232	317	16	565
Jacksonville	64	118	73	255
New York	346	272	37	655
Los Angeles	391	378	121	890
Miami	80	215	28	323
Memphis	48	164	25	237
Minneapolis	92	209	6	307
Chicago	437	692	26	1155
Seattle	112	267	26	405
Oakland	94	229	19	342
Salt Lake City	30	67	0	97
Kansas City	168	233	30	431
Total	3701	5631	757	10089

Flights with origin and destination in different centers

Total	3860	7812	1605	13277
Total Flights	7799	13530	4317	25646

Appendix B
On Simulation Strategies and Simulation Programming Languages

When this project was undertaken, one view that was expressed held that in the long run there would be a great economy in building a very detailed computer model of the air traffic system that would contain every feature pertinent to almost any simulation one might wish to undertake. The economy was expected in the ease of adapting this model to deal with one or another question one might seek to answer by simulation. Specifically in this project it should be very easy to adapt this model to any code assignment plan that could be devised.

The contrary view was that no computer memory is large enough to store all that detail and no computer fast enough to run such a simulation at a reasonable speed. The imperatives of economy of memory and of computer time require that one write a specific simulation program for each question, and that one include in it no detail not relevant to that question. A simulation should use as simplified and abstract a model of reality as the question posed will allow.

The second view prevailed in the execution of this project, and the writers feel that the results amply justify this decision. Computing time never became a limitation, but staying within memory capacity definitely required shoehorning. The machine used is a UNIVAC 1108 with 65,536 words of memory, but only about 53,000 words are available to the user. Consider that 2,618 flights are in progress at one time. For each flight one must store at least these data: (1) origin, (2) destination, (3) speed, (4) distance travelled up to this time, and (5) beacon code. These five items were packed into four computer words,

but one must also store an event notice that will call the proper subroutine for the next event in the flight, either a handoff or an arrival. A handoff notice contains an identifier of the flight, identifiers of the two centers involved in the handoff, and two words of scheduling information packed into four words in all. If there are eight words stored for each of 2,618 flights, then 20,944 words are used to give this minimal description of the situation. One would like to store a few other things such as the direction cosines of the flight path but the necessity of shoehorning dictated that they be recomputed at each event.

Next are some data tables. For each of 1113 airports one stores x coordinate, y coordinate, and center using 3339 words. For 587 boundary points of centers one stores x, y, and adjacent center, using 1721 words. Four words of results tabulated for each of 21 centers and 24 hours comes to 2016 words. The table to show which codes are in use in which centers might be 700 words. Finally, the SIMSCRIPT system routines, the event routines, and necessary library routines for a typical simulation used 12,341 words. The total of the above is 41,061 words, so there is not much room for additional details.

Unfortunately all this has to be in memory all the time. There is no part that is unused long enough to permit moving it out and back in again. If some assignment plan should exceed memory capacity in spite of shoehorning, the most feasible tactic seems to be to simulate only a 50 percent sample of the traffic by using every other flight and counting two codes in use for it.

The running time of these simulations was gratifyingly short. Simulating a peak day required only about 10 minutes of computer time. For each of 27,692 flights one record was read from the exogenous events tape, and, on the average, three event routines were performed, a departure, a hand-off, and an arrival. This averages about 22 milliseconds per flight or only 7 milliseconds per event routine.

Those who urged the very detailed approach to simulation suggested that each aircraft in turn be advanced by one minute's flying time then a search be made to see whether it had crossed a center's boundary. This would have been much slower, possibly 30 times slower. A 10 minute simulation run is fine, but five hours?

The center assignment plan and the master assignment plan work so differently that they require almost completely different programs. The center plan jumps from flight to flight always doing next whatever departure, or handoff, or arrival occurs next in simulated time. In the master plan, however, the master center cannot issue a beacon code for a new flight plan until it has simulated the whole flight to find in which centers it will fly. So the sequence of work in the computer is quite different for the two plans.

What the programmer must rewrite, however, is only about 350 (FORTRAN-like) SIMSCRIPT statements. Most of the 12,000 or so words of simulation program in the computer memory are SIMSCRIPT system routines that the programmer never has to write and which are the same for any digital simulation whether of air traffic or anything else. The system dynamically allocates temporary storage for descriptions of flights and for event notices. It stacks event notices in their sequence

of performance and controls the progress of simulated time. It interprets, through indirect addressing, subscripted names such as CTRA(ORIGN(FLT)), which is the center in which is the airport that is the origin of a particular flight. The SIMSCRIPT programming language contains the invariant structure that is useful in one simulation after another. Thus it provides the economy that was sought in an elaborate invariant model.

The most notable alternative to SIMSCRIPT is GPSS, which possibly is even more popular. GPSS is based on block diagrams and requires little experience in programming; whereas SIMSCRIPT is nearly an extension of FORTRAN and requires the FORTRAN level of programming skill. A SIMSCRIPT program is easily changed by just replacing statements, but changing a GPSS program is likely to require extensive renumbering of blocks. Perhaps the fatal defect of GPSS for our purpose is that it would require flights to be generated internally according to some probability scheme such as the Poisson law. It cannot accept an external source of flights like the peak day tape. A lesser consideration is that, while there is a very good version of GPSS for the IBM System 360, the implementation on the UNIVAC 1108 is rather primitive.

SIMSCRIPT on the 1108 proved very convenient and reliable, and the programs should be transferable to an IBM System 360 with little change except for control cards.

Appendix C
Traffic Flow Data

The following tables describe the traffic sample employed in these simulations by giving for each center area and each hour of the day the number of departures to each center area, the number of arrivals from each center area, and the number of handoffs from each adjacent center. The events called departures in these tables are really the filing of a flight plan and the issuing of a beacon code. Actual departure occurs one half hour later.

Table 15. Departures from, arrivals at, and handoffs to each center by hours

NUMBER OF DEPARTURES FROM BOSTON

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
BOSTON		28	27	34	12	8	4	4	4	1	11	39	35	40	57	48	52	55	62	55	57	45	41	48	37	804
NEW YORK		23	19	12	7	3	4	2	2	2	3	22	35	38	24	30	32	17	34	35	31	32	33	35	17	492
WASHINGTON		2	1	1	1	1	0	0	0	0	0	7	8	9	5	5	1	3	6	10	7	7	7	1	5	87
JACKSONVILLE		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	1	0	0	0	4
MIAMI		0	0	0	1	0	0	0	0	0	0	0	0	2	2	1	1	1	1	0	0	1	3	0	0	13
CLEVELAND		2	4	4	4	3	0	3	0	0	0	7	9	10	6	7	3	8	7	6	9	7	5	7	8	119
ATLANTA		0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	1	0	0	1	0	1	0	0	6
INDIANAPOLIS		0	0	0	0	2	0	0	0	0	0	1	2	3	0	1	0	1	0	0	4	0	0	0	2	16
CHICAGO		0	1	1	2	0	1	0	0	0	0	0	4	2	2	4	8	1	1	8	4	2	2	2	2	47
MEMPHIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	3
MINNEAPOLIS		1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	3
KANSAS CITY		0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	1	0	1	0	6
DENVER		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
SEATTLE		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
OAKLAND		0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	2	1	0	6
LOS ANGELES		0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2	0	1	0	0	0	3	1	0	10
TOTAL		56	52	52	27	18	9	9	6	3	14	77	95	107	101	98	102	87	115	115	116	96	97	96	71	1619

NUMBER OF ARRIVALS AT BOSTON

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
BOSTON		42	27	32	26	15	7	3	3	4	1	11	35	37	37	55	58	49	57	60	61	50	46	45	44	805
NEW YORK		16	17	18	8	7	6	8	2	1	1	2	10	15	17	21	20	16	24	14	29	16	26	11	23	328
WASHINGTON		9	3	3	3	0	0	0	0	0	0	1	2	5	6	5	9	6	6	5	4	8	5	8	6	94
JACKSONVILLE		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	2	6
MIAMI		1	5	1	0	0	3	1	0	0	0	0	0	0	0	0	0	0	1	0	1	3	1	1	2	20
CLEVELAND		8	4	6	3	1	1	0	0	1	1	0	3	9	6	8	6	5	7	8	10	6	6	4	11	114
ATLANTA		0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	3
INDIANAPOLIS		1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	1	1	1	1	3	1	13
CHICAGO		0	3	2	1	2	2	0	0	2	0	1	0	0	0	4	2	0	0	4	1	1	0	1	2	28
MEMPHIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
HOUSTON		0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
KANSAS CITY		0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	5
FORT WORTH		1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
DENVER		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
ALBUQUERQUE		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
SEATTLE		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
OAKLAND		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	3
LOS ANGELES		0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2	0	0	6
TOTAL		81	63	63	42	25	19	12	5	9	4	15	52	68	68	95	96	77	96	94	109	88	88	73	92	1434

NUMBER OF HANDOFFS TO BOSTON

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
NEW YORK		31	33	28	12	12	12	7	5	1	3	6	23	24	40	38	32	34	30	35	40	40	32	27	50	595
CANADA		0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2	0	0	0	0	0	0	2	7
CLEVELAND		5	6	2	2	1	1	0	0	1	0	1	5	3	5	3	3	1	4	7	8	6	3	8	1	76
TOTAL		36	39	30	14	13	13	7	5	2	3	7	28	27	46	43	35	37	34	42	48	46	35	35	53	678

NUMBER OF DEPARTURES FROM NEW YORK

TO	AT GMT / EST	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON		18	20	7	8	9	5	2	1	1	2	10	20	19	14	22	17	19	15	25	27	20	11	22	14	328
NEW YORK		21	25	13	13	9	6	2	0	0	9	38	47	43	69	55	55	49	38	39	40	41	26	30	26	694
WASHINGTON		3	9	7	2	1	1	0	0	1	1	16	26	21	15	19	14	12	14	21	14	19	15	10	11	252
JACKSONVILLE		1	0	0	1	0	0	0	0	0	0	1	2	2	1	3	0	2	2	1	1	2	1	3	0	23
MIAMI		4	3	0	1	0	2	0	0	0	0	0	0	2	7	3	4	3	3	1	3	1	6	5	0	48
CLEVELAND		21	16	10	5	1	3	2	1	1	1	18	23	22	23	22	21	17	15	22	16	24	31	16	22	353
ATLANTA		0	1	1	3	0	0	2	1	0	0	2	7	4	2	1	2	4	0	3	2	0	6	5	3	49
INDIANAPOLIS		2	2	0	0	1	0	0	0	0	0	0	3	0	6	3	3	4	3	4	8	3	3	6	3	54
CHICAGO		7	2	6	2	8	0	3	2	1	0	2	7	5	5	10	8	9	6	8	7	8	7	9	8	130
MEMPHIS		2	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	2	7
HOUSTON		0	2	2	1	0	0	0	1	0	0	1	0	3	1	0	1	2	0	2	1	0	1	3	1	22
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	2	1	1	1	8
KANSAS CITY		0	0	0	1	0	0	1	0	0	0	0	2	4	1	0	0	1	2	0	0	2	2	4	2	22
FORT WORTH		0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	0	2	0	2	1	0	10
DENVER		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	1	0	3	0	0	7
ALBUQUERQUE		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
SALT LAKE CY		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
SEATTLE		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2
OAKLAND		1	0	0	2	0	1	3	0	0	0	0	0	2	2	4	1	1	2	3	1	1	1	2	2	29
LOS ANGELES		0	1	0	0	1	1	1	0	0	0	0	0	2	3	3	0	1	1	1	0	1	2	1	3	22
TOTAL		80	81	46	40	30	19	16	6	4	14	88	137	135	153	147	127	126	101	130	123	124	119	119	99	2064

NUMBER OF ARRIVALS AT NEW YORK

FROM	AT GMT / EST	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON		17	24	18	13	6	3	4	2	2	1	5	25	32	30	31	29	33	15	35	28	37	30	36	35	491
NEW YORK		30	19	20	17	11	9	5	2	0	0	16	38	42	46	64	65	51	46	42	36	46	39	26	25	695
WASHINGTON		18	25	21	8	4	1	2	0	5	2	3	12	22	23	32	29	27	26	20	27	34	25	19	32	417
JACKSONVILLE		3	3	0	0	0	0	0	1	1	2	2	0	0	1	0	1	3	2	1	0	1	1	4	5	31
MIAMI		4	9	1	0	1	12	1	0	1	0	0	0	1	0	2	7	7	1	2	12	9	9	7	5	91
CLEVELAND		15	17	20	5	2	8	4	2	1	5	3	8	30	25	28	20	28	17	24	23	28	32	24	24	393
ATLANTA		7	6	3	2	0	5	2	0	3	0	2	3	1	1	4	1	3	6	6	3	1	6	7	7	79
INDIANAPOLIS		4	3	1	3	1	0	2	0	1	0	0	0	2	3	0	8	2	2	3	3	4	5	5	8	60
CHICAGO		8	6	7	6	6	8	3	1	2	1	1	0	4	3	6	8	5	3	10	4	7	10	9	6	124
MEMPHIS		0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	1	1	7
HOUSTON		1	2	1	0	0	0	2	1	0	0	1	0	0	0	0	0	0	2	2	3	1	1	1	1	19
MINNEAPOLIS		1	2	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	3	2	0	2	0	14
KANSAS CITY		3	6	0	0	2	1	2	1	1	1	1	0	0	0	0	4	1	0	1	2	2	4	1	3	36
FORT WORTH		4	1	0	0	0	0	1	1	1	0	0	0	0	0	1	0	4	0	1	3	1	1	2	0	21
DENVER		0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	7
ALBUQUERQUE		0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0	0	5
SEATTLE		0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	2	7
OAKLAND		2	1	2	0	2	0	0	0	1	4	2	0	1	0	1	0	0	0	1	6	5	3	2	3	36
LOS ANGELES		3	1	1	1	3	0	0	0	0	0	6	3	1	1	0	0	0	0	0	1	7	3	2	5	38
TOTAL		120	126	98	55	39	47	28	11	20	19	43	89	136	134	170	173	164	123	150	157	189	170	148	162	2571

NUMBER OF HANDOFFS TO NEW YORK

FROM	AT GMT / EST	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON		26	30	18	18	14	7	6	2	2	2	7	46	54	61	41	48	47	29	44	57	53	52	57	43	764
WASHINGTON		52	46	30	13	13	15	7	6	11	4	10	23	35	38	49	42	49	51	43	57	63	51	58	54	820
CLEVELAND		48	51	37	21	29	15	5	10	16	9	16	35	57	59	53	60	55	36	60	68	79	72	53	68	1012
TOTAL		126	127	85	52	56	37	18	18	29	15	33	104	146	158	143	150	151	116	147	182	195	175	168	165	2596

NUMBER OF DEPARTURES FROM WASHINGTON

TO	AT GMT / EST 1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON	2	3	2	0	0	0	0	0	0	2	1	8	8	6	5	8	6	5	7	5	8	6	4	8	94
NEW YORK	22	20	13	3	0	3	0	4	3	3	10	25	30	31	26	26	24	25	26	35	20	26	24	18	417
WASHINGTON	31	23	26	5	7	3	2	1	1	11	26	41	69	71	71	54	54	51	64	61	44	28	34	32	810
JACKSONVILLE	3	2	0	0	0	1	0	0	1	1	1	4	6	5	7	6	4	9	8	8	7	2	1	8	84
MIAMI	0	1	0	0	0	0	0	0	0	0	0	3	6	3	4	2	2	3	1	3	0	1	1	2	32
CLEVELAND	3	2	6	0	0	0	0	0	0	1	2	13	5	6	4	9	5	7	7	8	6	6	2	10	102
ATLANTA	7	3	4	2	1	1	0	1	0	0	3	11	16	6	9	4	12	8	10	7	7	10	12	7	141
INDIANAPOLIS	4	1	2	1	0	0	0	0	1	1	3	6	4	6	7	2	7	2	9	3	8	6	4	3	80
CHICAGO	4	0	2	0	2	0	0	0	0	0	0	6	0	3	6	1	7	4	5	1	3	4	5	1	54
MEMPHIS	1	1	0	0	0	2	0	0	0	0	2	3	6	2	4	2	2	2	1	1	3	3	1	1	37
HOUSTON	0	0	1	0	0	0	0	0	0	0	0	0	2	2	1	0	2	0	1	3	1	0	3	0	16
MINNEAPOLIS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	1	0	0	0	2	0	7
KANSAS CITY	0	0	0	1	0	0	0	0	0	0	0	2	2	0	0	3	2	0	2	0	2	5	0	2	21
FORT WORTH	0	0	0	1	1	0	0	0	0	0	0	1	0	2	0	3	1	3	2	1	1	1	1	1	19
GREAT FALLS	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
DENVER	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	4
ALBUQUERQUE	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
SEATTLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
OAKLAND	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	5
LOS ANGELES	0	0	0	1	0	0	0	0	0	0	0	0	1	2	1	1	0	1	1	0	0	4	0	0	12
TOTAL	78	56	56	14	11	10	2	6	6	19	49	124	158	145	145	123	129	122	146	136	110	103	97	93	1938

NUMBER OF ARRIVALS AT WASHINGTON

FROM	AT GMT / EST 1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON	3	3	1	2	0	1	1	0	0	0	0	3	6	7	9	7	2	3	5	2	10	9	8	5	87
NEW YORK	11	3	10	6	1	2	1	0	0	1	1	11	24	28	13	23	13	8	17	19	16	15	17	12	252
WASHINGTON	31	36	27	22	7	5	2	4	0	1	16	26	45	56	71	77	51	51	51	67	50	56	27	31	810
JACKSONVILLE	8	3	6	2	2	2	1	0	1	1	0	0	2	0	8	1	4	8	6	5	5	5	4	6	80
MIAMI	2	2	0	0	0	2	0	0	0	0	0	0	0	1	0	5	1	1	3	2	0	6	2	2	29
CLEVELAND	8	8	3	0	1	0	1	0	0	0	0	0	11	9	4	7	13	6	8	11	10	7	3	3	113
ATLANTA	9	4	6	4	4	3	0	1	0	0	1	1	5	5	8	11	14	5	17	7	5	9	13	13	145
INDIANAPOLIS	8	0	4	7	4	0	3	1	0	0	0	0	0	5	7	6	8	7	12	5	11	3	5	9	105
CHICAGO	1	5	3	4	2	3	1	0	1	0	0	0	0	1	3	4	2	1	3	3	2	3	1	2	45
MEMPHIS	2	3	1	0	1	0	1	2	0	0	0	0	0	0	0	1	1	0	0	1	3	3	3	1	23
HOUSTON	1	0	2	1	0	0	0	0	0	0	1	0	0	0	1	0	3	1	1	0	1	0	0	0	12
MINNEAPOLIS	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
KANSAS CITY	1	2	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	2	1	1	0	3	2	16
FORT WORTH	3	1	2	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	1	2	5	1	0	1	20
DENVER	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	5
ALBUQUERQUE	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
SEATTLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	4
OAKLAND	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	5
LOS ANGELES	2	0	1	1	0	0	0	0	0	0	3	1	0	0	0	0	0	0	1	0	3	1	0	1	14
TOTAL	95	71	68	49	22	18	12	8	3	4	22	42	93	112	125	143	114	92	130	128	124	118	87	88	1768

NUMBER OF HANDOFFS TO WASHINGTON

FROM	AT GMT / EST 1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
NEW YORK	22	11	21	7	12	4	4	3	0	1	3	26	47	52	37	44	23	28	41	30	36	29	44	35	560
JACKSONVILLE	22	5	5	3	20	3	1	2	3	2	2	1	3	4	14	21	11	11	19	21	18	19	18	24	252
CLEVELAND	29	12	12	8	7	5	3	2	3	1	3	2	13	17	8	18	17	11	22	23	27	17	13	17	290
ATLANTA	25	17	8	8	11	4	2	3	2	4	2	3	8	14	17	22	26	19	19	19	19	31	24	15	322
INDIANAPOLIS	12	5	7	3	3	3	1	4	0	0	1	0	2	7	4	11	13	5	9	13	13	7	6	10	139
TOTAL	110	50	53	29	53	19	11	14	8	8	11	32	73	94	80	116	90	74	110	106	113	103	105	101	1563

NUMBER OF DEPARTURES FROM JACKSONVILLE

TO (AT GMT / EST)	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	1	0	6
NEW YORK	0	0	0	1	0	0	1	0	3	1	0	0	1	2	3	2	0	0	1	2	4	4	4	2	31
WASHINGTON	4	3	1	0	2	1	0	2	0	1	0	1	2	8	2	4	8	7	6	4	4	5	9	6	80
JACKSONVILLE	23	14	12	9	4	4	1	0	5	3	3	16	22	56	36	42	46	35	44	44	33	26	34	21	533
MIAMI	7	7	3	3	4	0	2	1	2	0	2	4	7	2	6	7	6	4	13	6	8	8	11	11	124
CLEVELAND	0	1	1	1	0	0	1	0	0	0	0	0	0	1	1	0	0	1	1	0	3	2	1	1	15
ATLANTA	7	5	5	9	2	2	1	0	1	4	2	12	16	20	16	14	16	11	12	19	15	23	14	16	242
INDIANAPOLIS	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	3	3	2	0	0	0	1	12
CHICAGO	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	1	1	0	1	0	1	8
MEMPHIS	1	0	0	0	0	0	0	0	0	0	0	0	1	2	1	1	1	1	3	2	0	1	1	1	16
HOUSTON	1	1	1	1	0	1	0	0	0	0	0	1	2	3	4	1	6	1	5	2	2	5	1	2	40
MINNEAPOLIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
KANSAS CITY	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	0	0	0	6
FORT WORTH	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	1	0	2	1	1	4	1	1	1	16
ALBUQUERQUE	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	1	1	0	0	0	0	6
OAKLAND	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	4
LOS ANGELES	2	2	4	3	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	1	0	4	0	2	22
TOTAL	49	33	27	27	12	8	6	3	11	9	7	35	54	99	71	79	87	67	93	85	76	81	78	65	1162

NUMBER OF ARRIVALS AT JACKSONVILLE

FROM (AT GMT / EST)	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	4
NEW YORK	2	1	1	0	1	0	0	0	0	0	0	0	0	3	2	1	3	0	0	3	2	1	2	1	23
WASHINGTON	6	5	1	2	0	0	1	0	0	0	1	2	4	1	5	4	8	7	5	11	7	6	8	0	84
JACKSONVILLE	29	21	17	13	7	5	3	1	0	4	5	5	13	16	41	50	39	50	32	40	41	42	35	24	533
MIAMI	3	4	7	5	3	2	1	1	1	1	0	1	1	5	8	6	6	6	8	7	15	12	9	6	118
CLEVELAND	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	2	1	0	0	8
ATLANTA	11	7	11	8	7	5	0	0	0	1	1	1	5	7	8	5	16	18	12	11	14	18	17	11	194
INDIANAPOLIS	0	1	0	0	0	0	0	1	0	0	0	0	0	1	2	0	0	0	2	2	1	2	3	2	17
CHICAGO	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	6
MEMPHIS	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	1	5	1	3	0	1	18
HOUSTON	3	2	3	6	0	1	0	0	0	0	0	0	0	1	0	3	3	7	7	4	2	5	6	1	54
MINNEAPOLIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
KANSAS CITY	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	1	0	0	0	0	7
FORT WORTH	1	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	2	3	2	1	2	1	1	1	20
ALBUQUERQUE	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	5
SEATTLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
OAKLAND	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	4
LOS ANGELES	2	1	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	1	0	0	2	11
TOTAL	60	49	44	37	22	14	5	3	2	6	8	9	24	34	67	71	83	94	70	88	91	92	84	51	1108

NUMBER OF HANDOFFS TO JACKSONVILLE

FROM (AT GMT / EST)	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
WASHINGTON	13	5	8	2	2	0	4	0	0	1	1	5	5	9	23	16	15	11	18	17	14	8	11	9	197
MIAMI	22	10	10	27	17	6	3	3	2	2	0	2	6	28	37	20	20	18	46	51	40	43	37	34	484
ATLANTA	31	33	23	25	15	19	4	4	2	1	2	4	11	19	21	22	44	53	30	42	38	48	37	32	560
HOUSTON	9	6	8	8	2	0	0	1	0	1	0	0	0	2	4	6	9	10	8	13	8	10	6	6	117
TOTAL	75	54	49	62	36	25	11	8	4	5	3	11	22	58	85	64	88	92	102	123	100	109	91	81	1358

NUMBER OF DEPARTURES FROM MIAMI

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
BOSTON		1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	4	1	2	1	4	1	20
NEW YORK		0	0	11	2	1	1	0	0	0	0	1	0	5	7	4	3	5	12	9	6	8	4	8	4	91
WASHINGTON		0	0	0	2	0	0	0	0	0	0	0	1	0	6	1	2	1	3	0	6	1	1	4	1	29
JACKSONVILLE		3	6	5	4	1	0	1	0	1	0	1	3	9	10	8	4	3	11	6	11	14	10	2	5	118
MIAMI		11	18	13	10	9	3	6	5	2	1	16	30	43	28	23	29	20	28	36	26	22	23	14	15	431
CLEVELAND		1	1	2	3	1	0	1	0	0	0	0	0	1	3	2	2	1	4	5	2	4	2	3	3	41
ATLANTA		2	1	2	1	2	2	1	0	1	1	0	2	9	1	4	4	1	6	10	1	8	10	2	4	75
INDIANAPOLIS		0	0	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	3	2	0	2	0	0	3	14
CHICAGO		0	0	6	1	0	0	0	0	0	0	0	0	1	3	1	0	2	0	7	0	2	3	3	3	32
MEMPHIS		0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	2	0	1	0	6
HOUSTON		0	1	0	0	0	0	0	0	0	0	0	0	1	7	0	1	1	5	0	2	3	1	3	1	26
KANSAS CITY		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	4	0	0	1	7
FORT WORTH		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	1	0	1	1	0	10
ALBUQUERQUE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
OAKLAND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
LOS ANGELES		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	3
TOTAL		19	27	41	27	14	6	9	6	4	2	18	36	71	68	43	48	35	76	84	56	72	57	45	41	905

NUMBER OF ARRIVALS AT MIAMI

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
BOSTON		3	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	3	1	0	2	0	0	0	0	13
NEW YORK		4	2	1	5	1	1	0	2	0	0	0	0	0	0	1	6	3	4	4	3	2	3	0	6	48
WASHINGTON		0	3	0	1	0	0	0	0	0	0	0	0	0	0	6	4	3	3	3	2	3	3	0	1	32
JACKSONVILLE		16	10	6	8	3	3	0	2	0	2	1	2	2	5	5	5	4	7	7	8	10	5	6	7	124
MIAMI		18	8	20	14	11	4	7	4	3	3	3	15	30	31	33	27	26	30	31	26	26	22	24	15	431
CLEVELAND		0	1	1	1	1	2	0	0	0	0	0	0	0	0	3	3	2	2	3	0	1	0	0	0	20
ATLANTA		10	3	13	5	3	3	2	1	0	0	0	1	2	1	2	2	2	7	7	8	4	9	8	5	98
INDIANAPOLIS		2	2	2	0	0	2	1	0	1	0	0	0	0	0	1	3	2	3	2	1	0	0	1	2	25
CHICAGO		2	1	1	0	1	2	9	0	0	0	0	0	0	0	0	0	2	4	3	2	3	3	1	0	34
MEMPHIS		0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	2	0	7
HOUSTON		6	3	2	2	1	1	0	0	0	0	0	0	0	0	0	4	1	1	0	1	2	0	3	0	27
KANSAS CITY		0	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0	1	1	1	2	0	0	1	0	10
FORT WORTH		0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	4
DENVER		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ALBUQUERQUE		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	5
OAKLAND		0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
LOS ANGELES		1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3
TOTAL		62	34	49	38	21	21	19	9	6	6	4	19	34	37	54	55	49	65	61	56	56	46	46	37	884

NUMBER OF HANDOFFS TO MIAMI

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
JACKSONVILLE		36	25	31	18	12	18	5	5	3	3	0	4	8	8	20	34	32	28	33	34	26	28	20	32	463
TOTAL		36	25	31	18	12	18	5	5	3	3	0	4	8	8	20	34	32	28	33	34	26	28	20	32	463

NUMBER OF DEPARTURES FROM CLEVELAND

TO (AT GMT / EST)	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON	5	4	2	1	1	0	0	2	0	2	6	6	9	5	5	8	4	8	9	7	5	7	11	7	114
NEW YORK	19	19	4	3	8	3	4	1	5	4	11	29	26	30	22	21	21	24	24	29	30	22	26	8	393
WASHINGTON	5	3	1	0	1	0	0	0	0	0	3	12	6	6	7	14	6	7	10	10	6	2	4	10	113
JACKSONVILLE	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	2	1	0	0	0	1	8
MIAMI	1	2	1	1	0	0	0	0	0	0	0	0	5	4	0	1	3	0	1	0	0	0	0	1	20
CLEVELAND	30	32	22	24	13	13	4	6	4	8	33	82	71	67	74	49	59	72	69	64	70	57	48	43	1014
ATLANTA	1	0	2	2	2	1	0	0	1	1	1	4	5	3	4	3	2	4	4	0	2	6	4	3	55
INDIANAPOLIS	8	8	2	3	4	1	0	3	3	2	8	22	14	25	15	14	9	21	20	14	15	6	10	4	231
CHICAGO	8	12	8	11	6	2	3	4	5	6	6	21	20	20	23	21	18	15	25	18	19	18	14	14	317
MEMPHIS	0	0	1	2	0	0	0	1	0	0	0	2	1	1	1	2	0	0	0	1	0	1	0	0	13
HOUSTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
MINNEAPOLIS	0	1	0	0	1	0	2	0	0	1	0	1	6	7	6	1	6	4	4	2	4	7	2	1	56
KANSAS CITY	4	0	0	3	1	1	2	1	1	1	1	6	2	1	2	1	3	2	4	1	0	4	2	0	43
FORT WORTH	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	2	0	1	0	0	6
GREAT FALLS	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
DENVER	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
OAKLAND	0	0	0	0	0	0	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	1	0	1	7
LOS ANGELES	0	1	1	0	0	0	0	1	1	0	1	0	1	1	2	4	0	0	0	0	1	2	2	0	18
TOTAL	83	82	45	50	37	21	15	20	20	25	70	186	167	173	164	140	131	158	174	149	153	134	123	93	2413

NUMBER OF ARRIVALS AT CLEVELAND

FROM (AT GMT / EST)	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON	8	1	7	2	5	3	0	2	1	0	0	8	8	6	7	6	5	6	6	6	13	6	3	10	119
NEW YORK	24	21	17	9	5	2	3	3	1	1	0	16	20	23	20	24	19	21	14	19	16	23	31	20	352
WASHINGTON	8	5	2	6	0	0	0	0	0	0	1	3	7	9	6	4	6	4	9	9	9	4	6	4	102
JACKSONVILLE	2	0	2	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	1	1	1	1	2	0	15
MIAMI	1	5	1	1	2	4	0	1	1	0	0	0	0	0	1	1	2	3	2	2	3	5	2	4	41
CLEVELAND	43	29	33	24	21	12	12	5	5	3	8	51	73	65	67	78	55	51	66	75	65	73	64	36	1014
ATLANTA	9	5	1	1	0	2	0	1	0	0	2	1	0	0	1	2	3	2	2	2	6	2	3	5	50
INDIANAPOLIS	11	13	9	4	5	4	3	3	1	1	1	0	10	10	9	7	7	11	11	10	15	15	24	18	202
CHICAGO	24	16	14	9	13	9	3	3	2	1	0	4	6	17	16	16	8	16	16	15	23	28	23	17	299
MEMPHIS	1	0	1	0	0	0	0	0	0	0	0	0	0	2	0	1	1	2	0	2	0	2	2	1	15
HOUSTON	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
MINNEAPOLIS	4	0	1	4	2	1	1	0	0	0	1	0	2	4	2	3	3	3	3	8	1	2	1	0	46
KANSAS CITY	1	2	1	1	0	0	2	0	0	0	0	0	0	0	0	1	1	3	2	3	1	2	0	0	20
FORT WORTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
OAKLAND	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	6
LOS ANGELES	1	2	0	0	1	0	0	1	1	0	3	1	0	1	0	0	0	0	0	0	5	0	0	1	17
TOTAL	139	99	89	63	55	38	24	21	12	6	16	84	126	137	129	144	111	122	133	152	159	165	161	117	2302

NUMBER OF HANDOFFS TO CLEVELAND

FROM (AT GMT / EST)	1 / 20	2 / 21	3 / 22	4 / 23	5 / 24	6 / 1	7 / 2	8 / 3	9 / 4	10 / 5	11 / 6	12 / 7	13 / 8	14 / 9	15 / 10	16 / 11	17 / 12	18 / 13	19 / 14	20 / 15	21 / 16	22 / 17	23 / 18	24 / 19	TOTAL
BOSTON	2	3	5	1	4	0	1	1	0	0	1	5	7	7	5	4	5	11	2	6	7	3	4	8	92
NEW YORK	53	49	22	23	18	16	10	10	4	4	3	32	63	63	60	51	66	37	40	60	64	66	68	53	935
WASHINGTON	17	10	9	6	10	1	0	1	0	0	2	7	19	15	15	18	23	19	9	25	16	14	21	16	273
CANADA	10	7	5	1	1	2	0	1	3	0	0	5	4	9	7	11	12	12	13	9	10	3	12	17	154
INDIANAPOLIS	53	29	25	18	10	13	9	8	4	6	14	4	24	22	20	28	18	34	43	41	48	51	47	45	614
CHICAGO	46	29	25	20	31	12	4	15	7	4	5	11	20	38	24	24	23	38	42	49	50	52	38	39	646
MINNEAPOLIS	4	1	0	3	1	1	0	0	2	0	1	2	1	3	1	4	2	2	5	1	0	1	3	1	39
TOTAL	185	128	91	72	75	45	24	36	20	14	26	66	138	157	132	140	149	153	154	191	195	190	193	179	2753

NUMBER OF DEPARTURES FROM ATLANTA

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
BOSTON		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3
NEW YORK		4	3	2	2	2	1	2	1	2	1	2	2	5	1	1	4	8	2	4	6	5	7	5	7	79
WASHINGTON		7	3	2	5	2	1	0	0	1	0	1	4	8	11	12	9	8	16	6	7	14	11	8	9	145
JACKSONVILLE		5	12	8	7	4	0	0	0	1	1	0	8	9	4	8	16	16	13	14	13	19	15	10	11	194
MIAMI		7	10	4	1	2	1	1	0	0	0	1	4	0	4	1	5	11	7	4	7	9	5	7	7	98
CLEVELAND		3	2	0	1	0	1	0	0	1	1	1	1	1	1	1	2	3	4	5	3	3	6	7	3	50
ATLANTA		30	37	18	16	6	6	3	3	2	3	5	21	43	39	40	45	48	55	58	48	43	60	43	38	710
INDIANAPOLIS		8	3	0	0	1	2	0	0	4	0	0	3	4	6	2	8	7	8	8	7	8	5	6	5	95
CHICAGO		0	4	1	0	0	0	1	1	0	1	0	2	0	1	2	1	4	3	3	2	2	2	4	1	35
MEMPHIS		5	7	5	0	2	0	0	1	0	2	1	3	14	11	10	16	16	13	7	6	15	6	9	4	153
HOUSTON		4	3	2	2	1	1	0	0	1	0	3	2	2	4	4	2	8	7	2	6	5	8	4	1	72
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
KANSAS CITY		0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	2	0	1	1	9
FORT WORTH		1	1	0	1	1	0	0	0	0	1	1	2	1	0	2	1	1	2	2	2	2	4	2	3	30
DENVER		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3
ALBUQUERQUE		0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	1	0	4
OAKLAND		1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4
LOS ANGELES		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
TOTAL		76	87	43	35	22	13	7	6	12	12	15	52	89	82	83	114	131	130	114	109	128	129	108	91	1688

NUMBER OF ARRIVALS AT ATLANTA

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
BOSTON		0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	1	0	0	1	0	1	6
NEW YORK		2	5	1	1	1	3	0	1	2	0	0	1	3	5	3	3	0	4	2	1	2	3	1	5	49
WASHINGTON		9	8	2	5	2	1	0	1	0	1	0	2	7	14	12	7	5	11	8	10	8	8	9	11	141
JACKSONVILLE		17	9	6	7	3	6	2	1	0	1	4	3	10	15	23	17	12	14	10	15	13	21	19	14	242
MIAMI		8	3	1	3	1	1	2	1	1	0	2	0	1	6	3	2	4	3	2	8	5	8	9	1	75
CLEVELAND		5	2	2	0	2	2	1	2	0	0	1	1	0	7	3	0	5	3	3	5	2	2	4	3	55
ATLANTA		37	31	36	21	14	6	7	2	3	2	2	11	18	37	48	46	39	45	53	55	49	48	56	44	710
INDIANAPOLIS		10	6	2	2	4	1	1	0	0	0	3	0	1	8	8	6	7	8	6	2	14	10	11	4	114
CHICAGO		1	3	1	2	0	0	0	1	2	0	1	0	1	0	3	1	0	4	2	0	2	3	2	4	33
MEMPHIS		5	3	3	5	1	0	2	0	1	0	0	1	3	5	7	9	5	8	8	9	8	10	7	10	110
HOUSTON		4	5	1	2	2	1	1	1	3	0	0	0	0	3	2	4	2	0	3	4	4	2	4	3	51
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
KANSAS CITY		1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	1	0	2	0	2	3	14
FORT WORTH		1	2	1	0	1	0	0	0	0	1	0	0	0	3	1	2	2	4	2	6	2	3	2	3	36
DENVER		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ALBUQUERQUE		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
SALT LAKE CY		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
OAKLAND		0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	4
LOS ANGELES		0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	5
TOTAL		101	79	57	48	33	22	17	10	12	6	13	19	44	107	113	99	83	104	101	116	112	122	126	107	1651

NUMBER OF HANDOFFS TO ATLANTA

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	EST	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
WASHINGTON		19	12	3	11	8	3	0	1	4	0	1	7	21	29	17	18	21	20	11	24	15	14	20	17	296
JACKSONVILLE		39	21	7	28	19	6	6	6	3	1	5	6	13	28	52	27	24	34	30	56	34	58	45	39	587
INDIANAPOLIS		23	8	10	7	13	8	3	1	0	2	3	0	8	21	23	18	19	21	21	23	25	22	17	24	320
MEMPHIS		26	11	12	11	9	6	6	2	4	5	1	3	10	14	16	21	23	27	25	26	25	31	19	28	361
HOUSTON		3	3	1	3	1	0	0	1	1	0	0	0	2	4	3	2	3	1	4	3	3	5	1	1	45
TOTAL		110	55	33	60	50	23	15	11	12	8	10	16	54	96	111	86	90	103	91	132	102	130	102	109	1609

NUMBER OF DEPARTURES FROM INDIANAPOLIS

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	2	3	0	1	0	13
NEW YORK		1	1	3	1	0	1	0	1	0	0	0	3	4	3	5	0	3	5	2	3	8	5	7	4	60
WASHINGTON		1	5	6	3	3	0	1	0	0	0	0	2	7	7	4	10	9	7	9	7	4	8	8	4	105
JACKSONVILLE		0	0	0	1	0	0	0	0	0	0	0	2	0	1	1	0	1	3	3	2	1	0	2	0	17
MIAMI		0	0	0	2	1	0	1	0	0	0	0	1	1	5	1	3	1	0	2	0	3	1	1	2	25
CLEVELAND		14	6	7	4	3	4	1	1	2	1	2	8	10	6	10	7	12	10	10	18	20	22	13	11	202
ATLANTA		4	2	4	1	1	1	0	0	1	2	1	6	5	10	6	7	4	7	7	12	10	9	6	8	114
INDIANAPOLIS		36	26	18	20	9	2	2	0	0	0	2	15	41	50	56	46	36	39	34	51	51	44	52	37	667
CHICAGO		10	5	7	3	4	1	1	2	0	0	2	0	16	15	7	6	9	5	4	8	13	8	12	8	146
MEMPHIS		2	3	4	0	0	0	1	0	0	1	0	1	1	9	5	4	5	6	2	3	4	3	3	4	61
HOUSTON		3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	1	1	0	1	0	0	9
MINNEAPOLIS		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	1	0	6
KANSAS CITY		2	7	4	1	1	1	0	0	0	0	1	5	3	5	5	4	4	7	0	2	5	1	5	1	64
FORT WORTH		1	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	1	1	2	2	1	2	0	1	16
DENVER		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
ALBUQUERQUE		1	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	0	3	8
OAKLAND		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
LOS ANGELES		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	4
TOTAL		75	56	53	36	22	10	7	4	3	4	10	44	92	116	104	88	88	93	77	113	125	104	111	85	1520

NUMBER OF ARRIVALS AT INDIANAPOLIS

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		0	2	0	0	0	1	0	1	0	0	0	0	1	1	2	1	1	2	0	0	1	2	1	0	16
NEW YORK		3	6	2	0	0	1	0	0	0	0	0	0	1	1	3	4	2	5	2	4	7	6	1	6	54
WASHINGTON		5	3	2	1	2	0	0	0	0	0	1	3	3	8	4	6	4	7	2	4	5	7	7	6	80
JACKSONVILLE		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1	4	2	0	0	12
MIAMI		0	2	1	0	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	2	3	0	2	0	14
CLEVELAND		8	6	6	4	2	3	2	1	1	3	4	7	20	12	23	16	13	14	22	17	13	12	14	8	231
ATLANTA		7	8	6	0	0	1	2	0	0	2	2	0	1	7	4	2	7	7	5	7	10	7	6	4	95
INDIANAPOLIS		38	38	23	16	22	6	4	1	0	0	0	2	22	34	50	57	48	35	44	32	51	49	45	50	667
CHICAGO		14	9	7	5	11	3	0	2	2	0	0	4	3	13	10	8	10	10	8	16	7	14	15	10	181
MEMPHIS		3	2	2	1	0	0	0	1	0	0	0	1	2	0	5	1	3	3	1	3	4	1	7	3	43
HOUSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	3
MINNEAPOLIS		1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	1	0	6
KANSAS CITY		2	3	1	1	3	1	1	1	1	0	0	0	2	3	5	0	2	1	2	5	4	5	5	2	50
FORT WORTH		1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	2	0	1	1	11
DENVER		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ALBUQUERQUE		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
OAKLAND		0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3
LOS ANGELES		0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	2	0	5
TOTAL		82	83	52	29	40	18	9	9	4	7	9	17	55	79	107	97	93	85	90	92	113	106	108	90	1474

NUMBER OF HANDOFFS TO INDIANAPOLIS

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
WASHINGTON		8	3	4	1	0	1	2	0	0	1	1	2	10	10	12	9	7	11	10	14	6	12	11	11	146
CLEVELAND		32	16	16	6	15	10	4	4	4	4	1	17	42	42	52	35	37	37	38	40	39	32	35	28	586
ATLANTA		18	23	9	2	9	8	4	0	1	8	2	1	4	8	11	13	13	22	20	25	28	21	17	23	290
CHICAGO		35	16	23	16	31	14	6	7	7	11	14	7	20	24	28	26	30	19	24	49	35	26	34	39	541
MEMPHIS		15	4	5	5	6	1	4	4	1	0	0	3	4	5	10	10	14	12	16	15	14	17	14	19	198
KANSAS CITY		11	10	5	4	6	5	4	1	3	9	2	0	4	6	12	5	6	6	10	16	19	15	12	15	186
TOTAL		119	72	62	34	67	39	24	16	16	33	20	30	84	95	125	98	107	107	118	159	141	123	123	135	1947

NUMBER OF DEPARTURES FROM CHICAGO

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		2	1	2	2	0	0	2	0	1	0	0	1	2	3	0	1	3	1	1	0	0	3	0	3	28
NEW YORK		5	5	9	6	5	0	2	3	0	0	3	3	6	6	6	5	3	9	8	9	7	6	9	9	124
WASHINGTON		1	5	1	5	1	0	0	1	0	0	0	0	2	4	3	1	4	1	3	2	3	2	2	4	45
JACKSONVILLE		1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	1	6
MIAMI		0	1	0	11	0	0	0	0	0	0	0	0	0	1	3	4	3	3	2	2	0	0	3	1	34
CLEVELAND		17	10	9	14	8	4	3	1	1	0	3	9	18	15	12	14	14	17	12	26	27	28	16	21	299
ATLANTA		1	2	1	0	0	1	0	2	1	0	1	1	1	2	0	4	2	1	2	3	3	1	2	2	33
INDIANAPOLIS		6	7	5	11	3	1	1	2	0	0	3	6	16	9	6	8	10	12	15	9	11	15	8	17	181
CHICAGO		57	56	46	65	29	11	9	8	3	2	2	23	62	91	109	89	83	74	68	82	85	93	90	81	1318
MEMPHIS		1	0	1	0	0	0	0	0	0	0	0	1	1	3	2	0	0	3	2	1	0	2	1	1	19
HOUSTON		0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3	0	0	0	0	1	1	3	12
MINNEAPOLIS		12	11	13	11	6	3	0	2	2	1	0	1	4	14	15	8	13	8	8	10	9	8	4	6	169
KANSAS CITY		7	11	8	4	7	3	3	1	1	0	1	2	13	15	13	12	14	13	11	11	8	11	19	13	201
FORT WORTH		3	2	0	3	0	0	0	0	0	2	0	3	4	1	3	2	2	2	3	2	3	5	1	2	43
GREAT FALLS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
DENVER		3	1	4	1	2	3	1	2	0	1	0	0	0	2	5	1	6	3	3	2	2	3	4	4	53
ALBUQUERQUE		1	3	0	0	1	0	0	0	0	0	0	0	2	0	0	3	3	1	2	2	1	2	2	2	25
SALT LAKE CY		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	4
SEATTLE		1	1	1	0	0	0	1	1	1	1	0	0	0	0	0	3	1	0	1	1	0	1	1	4	19
OAKLAND		2	2	1	0	0	0	0	0	2	3	0	0	0	0	1	4	0	0	2	3	3	2	3	2	30
LOS ANGELES		2	3	3	2	0	2	1	2	1	2	1	1	0	1	4	5	2	4	4	3	3	1	5	3	55
TOTAL		122	123	104	135	62	28	23	25	13	12	14	51	132	168	182	166	167	152	149	171	166	185	172	179	2701

NUMBER OF ARRIVALS AT CHICAGO

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		3	1	2	0	1	2	0	1	0	0	0	0	0	5	2	3	3	3	1	5	6	5	3	1	47
NEW YORK		6	8	5	2	4	5	6	1	3	2	0	0	3	9	6	3	12	6	10	7	6	8	9	9	130
WASHINGTON		3	2	2	2	0	2	0	0	0	0	0	0	2	4	0	3	6	4	2	3	6	4	2	7	54
JACKSONVILLE		1	0	1	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	1	1	8
MIAMI		4	1	2	0	1	5	0	0	1	0	0	0	0	0	0	4	1	0	2	0	1	6	1	3	32
CLEVELAND		16	12	9	10	10	3	4	3	4	3	7	8	18	20	20	23	21	17	14	22	22	17	21	13	317
ATLANTA		4	2	1	1	3	0	0	0	0	2	1	0	1	1	1	1	1	2	2	3	1	3	3	2	35
INDIANAPOLIS		6	15	5	6	4	2	3	2	1	0	0	2	0	13	15	6	8	9	7	4	6	12	8	12	146
CHICAGO		86	63	53	45	67	26	10	9	6	4	3	4	21	64	98	105	92	79	71	68	84	76	98	86	1318
MEMPHIS		1	1	1	0	1	0	1	0	0	0	0	0	0	1	2	1	4	3	2	0	1	4	3	4	30
HOUSTON		2	2	1	2	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	3	0	1	0	15
MINNEAPOLIS		14	10	10	3	2	2	1	1	1	0	0	5	12	12	8	11	14	14	10	11	14	13	14	11	193
KANSAS CITY		16	15	7	7	5	3	2	0	5	1	1	1	2	6	15	10	10	8	14	6	10	15	7	10	176
FORT WORTH		2	6	0	1	2	0	1	0	0	0	0	0	0	1	2	6	3	3	2	2	3	3	2	6	45
GREAT FALLS		0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
DENVER		5	3	2	2	4	1	0	1	0	1	1	0	1	3	4	2	2	1	6	4	5	3	2	2	55
ALBUQUERQUE		1	2	0	1	0	0	1	0	0	0	0	2	0	0	0	0	0	1	3	1	1	1	3	1	18
SALT LAKE CY		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	3
SEATTLE		2	4	0	1	0	0	0	0	0	2	3	0	0	0	0	0	0	5	2	1	0	4	1	1	26
OAKLAND		3	4	2	1	0	0	1	1	2	2	3	1	0	0	0	0	0	1	6	2	3	2	2	2	38
LOS ANGELES		2	4	8	2	1	1	0	0	1	4	2	6	0	0	0	0	0	0	4	8	3	2	4	6	58
TOTAL		177	156	112	87	106	52	30	19	24	21	21	29	60	139	175	179	179	157	159	147	175	179	186	177	2746

NUMBER OF HANDOFFS TO CHICAGO

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
CLEVELAND		31	28	15	18	23	13	6	12	11	7	9	13	36	48	42	40	46	42	37	44	35	45	44	49	694
INDIANAPOLIS		33	17	19	15	15	20	4	10	3	7	6	5	10	29	35	21	31	24	24	31	28	41	31	38	497
MINNEAPOLIS		27	12	11	5	2	2	1	1	3	3	2	7	23	14	13	15	22	36	20	22	23	20	23	19	326
KANSAS CITY		30	30	11	14	13	3	6	3	5	11	6	1	6	15	26	24	23	20	24	30	25	30	29	37	422
DENVER		19	16	11	5	4	1	7	11	9	13	8	3	3	6	6	8	6	27	28	27	14	14	21	21	288
TOTAL		140	103	67	57	57	39	24	37	31	41	31	29	78	112	122	108	128	149	133	154	125	150	148	164	2227

NUMBER OF DEPARTURES FROM MEMPHIS

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
NEW YORK		1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	1	1	0	7
WASHINGTON		0	0	0	1	1	0	2	0	0	0	0	0	0	1	0	1	0	1	1	5	3	0	3	4	23
JACKSONVILLE		1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	5	1	3	0	2	0	18
MIAMI		1	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	2	0	0	1	0	0	7
CLEVELAND		1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	2	2	0	1	2	0	1	15
ATLANTA		4	3	4	1	1	0	1	1	0	0	1	3	8	5	8	7	9	5	9	8	9	11	8	4	110
INDIANAPOLIS		0	0	2	0	0	0	1	0	0	1	0	2	3	2	1	4	4	2	0	5	2	5	4	5	43
CHICAGO		0	1	0	2	0	0	0	0	0	0	1	0	3	2	1	5	1	0	1	4	5	2	1	1	30
MEMPHIS		14	8	3	3	2	3	3	1	1	0	3	23	18	21	25	21	20	18	20	21	22	23	15	10	298
HOUSTON		4	1	2	1	1	1	0	1	0	1	0	2	1	4	3	5	3	2	2	3	2	5	3	5	52
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
KANSAS CITY		4	2	4	1	1	0	2	0	0	0	0	0	2	6	5	5	3	5	7	4	6	5	4	1	67
FORT WORTH		3	2	1	1	1	0	1	1	1	1	0	0	2	7	7	5	8	2	5	6	2	5	3	8	72
DENVER		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2
ALBUQUERQUE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0	2	0	0	0	0	7
LOS ANGELES		0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	3
TOTAL		33	18	17	10	7	4	10	4	2	3	7	32	41	50	55	59	51	39	55	60	56	61	44	39	757

NUMBER OF ARRIVALS AT MEMPHIS

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
NEW YORK		1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	7
WASHINGTON		1	1	1	0	0	0	2	0	0	0	0	0	2	4	5	4	1	3	2	1	3	1	1	5	37
JACKSONVILLE		1	2	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	1	1	3	1	1	2	0	16
MIAMI		0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	2	6
CLEVELAND		0	0	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	2	0	0	0	1	1	0	13
ATLANTA		6	4	7	5	1	2	0	0	1	0	0	2	3	9	12	10	18	14	14	7	10	15	3	10	153
INDIANAPOLIS		2	4	3	3	1	0	0	1	0	0	1	0	0	0	5	8	7	3	4	4	5	2	4	4	61
CHICAGO		0	2	1	0	1	0	0	0	0	0	0	0	0	2	1	2	1	1	2	2	0	1	2	1	19
MEMPHIS		11	13	6	4	4	3	1	3	2	0	0	2	20	19	22	26	17	25	22	15	21	27	19	16	298
HOUSTON		2	1	1	2	3	3	0	0	0	0	0	0	0	2	2	3	5	8	7	1	3	3	5	3	54
MINNEAPOLIS		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
KANSAS CITY		4	2	0	4	4	4	1	1	1	0	0	0	0	1	3	3	2	5	0	3	4	2	5	2	51
FORT WORTH		6	3	0	0	1	2	0	0	0	0	0	3	5	10	5	5	4	4	7	10	7	2	5	5	84
DENVER		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	4
ALBUQUERQUE		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3	1	1	0	10
LOS ANGELES		0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	2	8
TOTAL		36	35	21	19	16	17	5	5	4	0	2	9	31	49	58	67	59	68	60	47	59	59	49	51	826

NUMBER OF HANDOFFS TO MEMPHIS

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
ATLANTA		26	18	13	12	12	4	1	3	1	2	2	7	15	25	21	27	33	29	27	23	35	26	34	22	418
INDIANAPOLIS		10	14	4	8	8	2	3	1	2	1	2	0	3	12	25	14	11	21	14	5	16	14	15	12	217
HOUSTON		5	5	6	1	3	5	2	0	1	0	0	0	1	2	6	4	9	8	8	7	10	5	5	7	100
KANSAS CITY		8	10	6	7	3	6	3	2	0	1	1	1	3	1	13	14	12	9	6	11	13	9	14	8	161
FORT WORTH		18	16	8	4	9	5	3	1	4	2	4	3	12	17	14	22	26	22	28	27	27	13	22	25	332
TOTAL		67	63	37	32	35	22	12	7	8	6	9	11	34	57	79	81	91	89	83	73	101	67	90	74	1228

NUMBER OF DEPARTURES FROM HOUSTON

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
NEW YORK		0	0	0	2	0	1	0	0	1	0	0	0	1	0	1	3	1	1	2	1	1	0	2	2	19
WASHINGTON		2	1	0	0	0	0	0	1	0	0	0	1	2	1	0	2	0	1	0	0	0	1	0	0	12
JACKSONVILLE		3	1	5	1	1	0	0	0	0	0	0	0	1	1	7	2	8	5	3	2	6	3	2	3	54
MIAMI		3	0	3	1	0	0	0	0	0	0	0	0	1	1	3	1	0	1	1	1	4	1	3	3	27
CLEVELAND		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
ATLANTA		4	0	4	0	3	0	2	1	0	0	0	1	2	4	3	1	1	3	5	4	6	1	3	3	51
INDIANAPOLIS		0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	3
CHICAGO		1	2	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	2	1	1	0	2	1	15
MEMPHIS		1	1	2	4	1	0	0	0	0	0	0	1	2	5	2	10	4	4	1	3	7	3	1	2	54
HOUSTON		41	30	37	18	12	6	4	4	0	2	2	5	27	65	81	85	94	83	73	81	68	87	68	53	1026
KANSAS CITY		2	2	1	2	0	0	1	0	0	0	0	0	1	3	2	1	1	1	1	1	0	2	3	3	27
FORT WORTH		7	6	4	5	10	2	0	0	0	1	1	0	9	11	14	23	15	23	10	22	18	21	19	11	234
GREAT FALLS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
DENVER		1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	2	0	1	1	0	0	9
ALBUQUERQUE		2	0	0	0	0	0	0	1	0	0	0	1	0	6	7	3	1	6	4	7	6	4	6	1	55
SALT LAKE CY		0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
SEATTLE		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
OAKLAND		0	0	1	1	0	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	1	1	2	0	11
LOS ANGELES		2	0	2	1	2	0	0	0	0	0	1	0	2	1	0	4	2	3	4	1	1	3	3	1	33
TOTAL		70	45	62	35	29	9	8	8	1	3	4	10	49	101	126	139	128	131	108	125	120	129	114	84	1638

NUMBER OF ARRIVALS AT HOUSTON

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
NEW YORK		2	3	0	0	3	1	1	0	0	1	0	0	1	0	0	3	0	0	3	0	2	1	0	1	22
WASHINGTON		2	2	0	0	1	0	0	0	0	0	0	0	0	0	2	2	1	0	0	0	1	2	1	2	16
JACKSONVILLE		3	1	0	2	1	0	0	0	0	0	0	1	0	0	3	7	2	1	4	2	5	1	3	4	40
MIAMI		1	1	1	0	0	0	0	0	0	0	0	0	0	0	3	2	0	4	2	3	1	1	3	4	26
CLEVELAND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2
ATLANTA		7	4	5	2	2	1	2	0	0	1	0	1	3	1	3	3	2	8	6	2	6	1	8	3	71
INDIANAPOLIS		1	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	3	0	0	9
CHICAGO		0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3	0	0	0	0	1	12
MEMPHIS		7	3	3	1	1	0	3	0	1	0	0	0	2	2	3	4	4	2	3	1	3	3	4	2	52
HOUSTON		57	44	37	32	23	10	6	3	5	0	2	3	6	18	65	72	90	85	94	68	82	76	76	72	1026
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
KANSAS CITY		4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	4	0	2	0	1	3	2	24
FORT WORTH		15	11	6	5	7	1	1	0	3	3	1	2	7	11	18	3	21	12	16	18	10	18	16	5	210
DENVER		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	1	0	7
ALBUQUERQUE		2	2	1	1	2	1	0	0	0	1	0	1	0	0	0	0	1	1	2	3	6	2	3	4	33
SALT LAKE CY		0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
SEATTLE		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
OAKLAND		0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	3	2	10
LOS ANGELES		4	1	2	0	1	4	0	0	0	1	0	0	2	1	0	0	0	1	1	0	2	2	4	2	28
TOTAL		106	78	58	47	41	19	14	3	10	7	4	8	21	33	97	100	125	121	135	102	119	113	126	105	1592

NUMBER OF HANDOFFS TO HOUSTON

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
JACKSONVILLE		5	2	3	3	0	0	0	0	1	0	0	0	3	4	7	8	9	8	11	12	9	5	11	9	110
ATLANTA		1	3	4	3	1	1	1	0	0	1	0	1	1	1	4	2	4	5	5	3	3	6	3	3	56
MEMPHIS		8	3	4	4	4	2	1	0	1	1	0	1	4	3	5	5	13	2	7	6	5	2	9	8	98
FORT WORTH		17	27	16	8	13	5	0	3	5	3	2	7	10	18	14	22	28	24	33	30	26	36	31	29	407
TOTAL		31	35	27	18	18	8	2	3	7	5	2	9	18	26	30	37	54	39	56	51	43	49	54	49	671

NUMBER OF DEPARTURES FROM MINNEAPOLIS

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
NEW YORK		1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2	3	2	0	2	0	1	1	14
WASHINGTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2
JACKSONVILLE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
CLEVELAND		2	0	5	1	1	0	0	0	0	1	1	4	5	2	2	1	4	5	5	1	2	0	2	2	46
ATLANTA		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2
INDIANAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	2	0	1	6
CHICAGO		12	8	3	2	1	1	1	1	0	0	2	15	13	9	10	15	15	9	11	16	12	11	13	13	193
MEMPHIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2
HOUSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MINNEAPOLIS		10	8	10	14	7	4	4	0	2	3	8	23	54	28	25	29	30	33	34	20	22	27	29	18	442
KANSAS CITY		0	0	0	0	0	0	0	0	0	0	1	1	2	1	0	2	5	1	0	0	2	1	1	1	18
FORT WORTH		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	3
GREAT FALLS		1	1	2	0	0	0	0	0	1	0	1	0	0	2	1	1	0	2	1	0	1	2	0	1	17
DENVER		0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	0	0	2	8
SALT LAKE CY		0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	3
SEATTLE		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	5
OAKLAND		0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	3
LOS ANGELES		0	0	1	0	0	1	0	0	0	0	0	0	2	0	1	0	0	0	1	2	0	0	1	1	10
TOTAL		27	19	24	18	9	6	5	1	3	4	13	45	79	43	40	53	60	54	57	42	42	43	49	41	777

NUMBER OF ARRIVALS AT MINNEAPOLIS

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	3
NEW YORK		1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	2	1	8
WASHINGTON		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	2	0	0	0	7
JACKSONVILLE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
CLEVELAND		3	1	1	0	0	1	0	2	0	0	0	1	0	3	6	8	3	3	4	7	2	4	5	2	56
ATLANTA		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2
INDIANAPOLIS		0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	6
CHICAGO		6	12	10	16	11	5	3	0	2	2	1	0	1	1	13	13	13	15	7	7	6	13	5	7	169
MEMPHIS		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
MINNEAPOLIS		19	11	9	10	12	9	2	4	0	2	1	11	21	42	38	31	27	26	33	33	26	22	20	33	442
KANSAS CITY		2	0	1	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	1	0	2	1	11
FORT WORTH		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	2
GREAT FALLS		0	1	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	2	0	2	1	1	0	10
DENVER		2	0	1	2	0	0	0	0	0	0	0	0	0	1	0	2	0	0	3	2	1	1	1	1	17
ALBUQUERQUE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
SALT LAKE CY		0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	4
SEATTLE		1	0	0	1	0	0	2	0	0	0	0	1	0	0	0	0	0	2	0	0	0	1	0	0	8
OAKLAND		2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
LOS ANGELES		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	1	1	7
TOTAL		39	27	22	33	25	15	7	9	2	4	2	14	22	49	60	60	44	50	51	52	41	42	40	49	759

NUMBER OF HANDOFFS TO MINNEAPOLIS

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
CANADA		0	0	1	0	0	0	0	0	0	0	1	0	0	1	2	0	0	0	1	3	0	1	0	0	10
CLEVELAND		1	0	1	1	1	0	0	1	0	0	0	0	1	3	10	3	2	2	5	2	3	3	7	2	48
CHICAGO		17	14	18	13	12	7	2	3	4	3	2	0	5	7	17	23	16	19	17	15	15	14	17	23	283
GREAT FALLS		1	4	1	1	0	2	2	2	2	2	1	0	0	1	1	0	5	7	2	0	5	6	1	2	48
DENVER		4	1	2	2	1	0	0	0	0	1	1	0	0	1	4	1	2	3	5	0	1	0	2	3	34
TOTAL		23	19	23	17	14	9	4	6	6	6	5	0	6	13	34	27	25	31	30	20	24	24	27	30	423

NUMBER OF DEPARTURES FROM KANSAS CITY

TO (AT GMT / CST)	1 / 19	2 / 20	3 / 21	4 / 22	5 / 23	6 / 24	7 / 1	8 / 2	9 / 3	10 / 4	11 / 5	12 / 6	13 / 7	14 / 8	15 / 9	16 / 10	17 / 11	18 / 12	19 / 13	20 / 14	21 / 15	22 / 16	23 / 17	24 / 18	TOTAL
BOSTON	0	0	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	5
NEW YORK	2	0	2	1	2	1	2	0	1	0	0	0	0	4	2	0	1	1	2	3	2	3	4	3	36
WASHINGTON	2	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	2	1	1	0	3	1	2	1	16
JACKSONVILLE	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	1	0	0	7
MIAMI	1	0	1	1	0	0	0	0	0	0	0	0	0	0	2	1	2	0	0	0	1	0	0	1	10
CLEVELAND	2	1	0	0	2	0	0	0	0	0	0	0	0	0	1	3	2	3	2	0	2	0	0	2	20
ATLANTA	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	2	0	1	1	1	4	1	14
INDIANAPOLIS	2	0	1	4	1	1	2	0	0	0	0	1	5	5	0	1	1	4	3	6	7	0	3	3	50
CHICAGO	15	5	8	6	2	2	0	4	2	2	0	2	7	16	12	7	7	15	9	8	13	9	14	11	176
MEMPHIS	4	1	5	1	4	1	1	1	0	0	0	0	1	3	3	3	4	0	4	5	3	3	3	1	51
HOUSTON	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	5	0	0	2	3	3	3	1	1	24
MINNEAPOLIS	1	0	0	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1	0	2	1	2	0	11
KANSAS CITY	24	24	20	20	11	9	3	9	6	2	0	7	36	38	44	43	43	43	32	46	52	50	34	30	626
FORT WORTH	5	7	6	6	4	2	1	1	0	3	0	1	3	3	7	3	4	6	9	9	8	13	10	9	120
GREAT FALLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
DENVER	4	3	2	3	0	0	1	1	0	0	0	0	0	2	3	4	0	1	3	2	2	2	5	5	43
ALBUQUERQUE	2	0	1	2	0	0	0	0	1	0	0	0	0	0	4	1	1	1	2	2	3	2	2	2	26
SALT LAKE CY	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
SEATTLE	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	6
OAKLAND	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	1	0	2	1	11
LOS ANGELES	1	1	0	0	1	2	1	0	0	1	0	0	0	0	2	0	0	1	3	1	2	2	0	4	22
TOTAL	69	44	49	47	27	19	12	16	10	8	1	13	54	79	87	74	68	80	74	86	106	91	87	75	1276

NUMBER OF ARRIVALS AT KANSAS CITY

FROM (AT GMT / CST)	1 / 19	2 / 20	3 / 21	4 / 22	5 / 23	6 / 24	7 / 1	8 / 2	9 / 3	10 / 4	11 / 5	12 / 6	13 / 7	14 / 8	15 / 9	16 / 10	17 / 11	18 / 12	19 / 13	20 / 14	21 / 15	22 / 16	23 / 17	24 / 18	TOTAL
BOSTON	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	2	0	6
NEW YORK	4	2	0	0	0	1	0	0	1	0	0	0	0	1	5	0	1	1	0	2	0	1	3	0	22
WASHINGTON	0	1	1	0	0	1	0	0	0	0	0	0	0	2	2	0	0	4	1	0	0	3	2	4	21
JACKSONVILLE	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	1	1	6
MIAMI	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	3	7
CLEVELAND	1	4	1	1	1	2	2	0	1	2	0	0	4	3	3	1	3	2	1	4	2	1	3	1	43
ATLANTA	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	1	1	9
INDIANAPOLIS	2	2	6	4	2	1	1	0	0	0	0	1	4	4	3	7	4	1	8	2	1	5	2	4	64
CHICAGO	12	8	10	9	7	7	2	2	1	1	2	0	2	8	16	16	13	12	14	7	14	8	12	18	201
MEMPHIS	2	3	2	4	1	1	0	1	1	0	0	0	0	2	4	7	3	5	5	3	6	6	6	5	67
HOUSTON	1	4	3	0	2	1	2	0	0	1	0	0	0	0	0	2	1	3	1	2	1	0	2	1	27
MINNEAPOLIS	1	1	0	0	0	0	0	0	0	0	0	0	0	3	1	1	0	4	1	3	0	0	3	0	18
KANSAS CITY	28	26	27	22	18	8	10	3	9	6	2	0	11	27	43	37	43	39	41	38	42	55	47	44	626
FORT WORTH	3	6	5	4	0	4	0	3	1	0	0	2	2	5	3	12	6	6	4	2	2	8	3	10	91
DENVER	2	3	4	1	0	1	1	1	0	0	1	1	0	0	5	2	2	2	3	3	3	3	2	2	42
ALBUQUERQUE	1	0	1	1	0	1	0	0	0	0	0	0	0	1	0	2	1	4	3	2	2	6	0	1	26
SALT LAKE CY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
SEATTLE	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	2	0	0	0	0	0	7
OAKLAND	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	0	1	8
LOS ANGELES	1	0	1	1	1	0	1	0	1	1	0	2	0	0	0	1	0	0	6	0	3	3	3	1	26
TOTAL	62	63	64	48	32	28	19	10	15	11	7	6	23	56	87	88	82	86	92	69	79	101	93	97	1318

NUMBER OF HANDOFFS TO KANSAS CITY

FROM (AT GMT / CST)	1 / 19	2 / 20	3 / 21	4 / 22	5 / 23	6 / 24	7 / 1	8 / 2	9 / 3	10 / 4	11 / 5	12 / 6	13 / 7	14 / 8	15 / 9	16 / 10	17 / 11	18 / 12	19 / 13	20 / 14	21 / 15	22 / 16	23 / 17	24 / 18	TOTAL
INDIANAPOLIS	10	8	11	4	7	4	1	1	1	1	1	4	10	17	17	15	9	9	12	7	13	11	20	13	206
CHICAGO	34	19	21	6	12	6	5	6	3	6	4	4	8	26	27	25	30	33	30	24	25	20	29	33	436
MEMPHIS	6	9	9	8	4	3	0	2	2	0	1	0	3	7	11	16	11	8	8	14	17	13	15	14	181
FORT WORTH	12	7	12	7	3	5	1	3	3	1	0	3	4	12	16	17	11	10	11	11	11	12	23	14	209
DENVER	10	10	9	4	0	3	2	1	11	7	3	0	0	4	1	6	5	7	22	11	10	11	12	6	155
ALBUQUERQUE	3	1	2	1	3	0	0	1	0	2	1	0	0	2	1	3	3	13	4	4	6	11	5	9	75
TOTAL	75	54	64	30	29	21	9	14	20	17	10	11	25	68	73	82	69	80	87	71	82	78	104	89	1262

NUMBER OF DEPARTURES FROM FORT WORTH

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
BOSTON		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2
NEW YORK		0	0	0	0	2	1	0	0	0	0	0	0	1	3	1	0	2	2	1	4	1	1	2	0	21
WASHINGTON		1	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	3	2	3	2	0	1	4	0	20
JACKSONVILLE		2	1	0	0	0	0	0	0	0	0	0	0	0	2	1	4	1	0	2	1	1	2	1	2	20
MIAMI		1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	4
CLEVELAND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
ATLANTA		1	1	0	1	0	0	0	1	0	0	0	3	1	3	1	6	1	6	3	3	1	1	2	1	36
INDIANAPOLIS		1	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	2	1	1	0	1	2		11
CHICAGO		0	1	1	1	1	0	0	0	0	0	0	2	2	5	5	2	4	0	5	2	2	6	4	2	45
MEMPHIS		3	1	0	0	2	0	0	0	1	2	2	6	8	5	5	6	5	6	7	11	2	3	4	5	84
HOUSTON		10	6	5	6	3	0	0	3	3	1	1	10	16	13	7	19	14	19	14	16	13	12	7	12	210
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2
KANSAS CITY		5	6	3	1	3	0	3	1	0	0	1	4	5	8	6	8	5	4	2	5	5	7	6	3	91
FORT WORTH		23	29	16	11	3	7	7	3	3	1	4	30	65	58	79	76	63	58	83	78	78	59	48	38	920
GREAT FALLS		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
DENVER		2	2	0	0	0	0	0	1	0	0	0	0	1	1	4	2	0	2	1	4	6	3	1	2	32
ALBUQUERQUE		5	5	2	1	2	1	0	0	0	0	0	1	8	7	4	3	3	7	6	5	12	16	8	5	101
SALT LAKE CY		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	3
SEATTLE		0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	4
OAKLAND		0	1	0	1	0	0	0	0	0	0	0	0	0	3	1	0	1	1	0	2	0	0	3	1	14
LOS ANGELES		3	4	3	1	0	0	0	0	1	1	0	1	1	4	6	3	4	2	0	4	1	5	6	2	52
TOTAL		58	58	30	23	18	10	10	9	8	5	9	58	108	115	123	129	107	110	134	138	123	119	97	76	1675

NUMBER OF ARRIVALS AT FORT WORTH

FRO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
NEW YORK		3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	0	0	1	1	0	10
WASHINGTON		1	1	0	0	0	1	1	0	0	0	0	0	0	1	0	2	0	2	1	3	2	2	1	1	19
JACKSONVILLE		1	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0	1	1	1	4	1	16
MIAMI		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	1	0	1	10
CLEVELAND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	2	6
ATLANTA		2	3	3	0	0	0	2	0	0	0	1	0	0	2	1	1	0	2	3	1	2	2	1	5	31
INDIANAPOLIS		0	2	0	1	0	0	0	0	0	0	0	0	0	2	0	3	1	0	2	0	2	1	2	16	
CHICAGO		2	2	2	2	1	2	0	0	0	0	0	2	1	1	3	2	5	2	2	0	2	5	2	5	43
MEMPHIS		6	3	3	1	0	2	0	1	1	1	1	0	0	1	4	7	10	5	4	1	5	7	5	4	72
HOUSTON		15	8	8	6	3	13	0	1	0	0	1	0	2	7	7	16	14	17	25	15	20	16	17	23	234
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	3
KANSAS CITY		9	10	6	8	4	4	2	1	3	1	2	0	1	2	4	5	4	5	4	9	6	8	14	8	120
FORT WORTH		41	34	31	15	11	3	6	5	6	2	0	8	24	55	59	55	91	59	63	80	80	76	65	51	920
GREAT FALLS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
DENVER		1	5	0	2	0	0	0	0	0	0	1	0	0	0	1	0	1	0	5	0	2	2	0	3	23
ALBUQUERQUE		3	5	3	2	3	2	0	0	0	0	0	0	2	2	3	5	6	5	5	7	6	7	9	4	79
SALT LAKE CY		1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4
SEATTLE		0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	1	0	0	7
OAKLAND		0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	2	1	0	2	2	1	0	0	12
LOS ANGELES		7	0	2	2	2	1	0	2	2	1	0	4	3	0	1	0	0	2	4	2	2	5	2	4	48
TOTAL		93	76	62	39	27	28	11	10	12	7	7	14	33	71	87	98	139	103	119	125	137	139	123	114	1674

NUMBER OF HANDOFFS TO FORT WORTH

FRO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	CST	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
MEMPHIS		18	20	15	10	4	11	4	2	1	1	4	2	1	5	19	25	23	26	18	19	25	21	25	22	321
HOUSTON		17	19	12	12	11	13	1	2	3	0	1	2	5	13	24	34	42	31	35	24	32	39	36	38	446
KANSAS CITY		17	12	11	14	5	3	0	2	2	3	2	0	2	11	10	13	9	9	11	14	14	20	26	22	232
ALBUQUERQUE		20	11	13	9	10	3	4	7	4	3	6	7	4	3	5	9	19	20	21	27	23	28	24	15	295
TOTAL		72	62	51	45	30	30	9	13	10	7	13	11	12	32	58	81	93	86	85	84	94	108	111	97	1294

NUMBER OF DEPARTURES FROM GREAT FALLS

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
CHICAGO		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
MINNEAPOLIS		1	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	1	1	0	2	2	0	0	0	10
FORT WORTH		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
GREAT FALLS		3	5	7	5	49	3	12	20	14	10	12	2	4	4	5	5	7	10	5	6	8	7	6	3	212
DENVER		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	3	0	1	10
SALT LAKE CY		0	2	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	3	1	0	10
SEATTLE		1	1	1	1	0	1	0	0	0	1	0	0	1	0	1	0	1	1	1	0	3	3	0	1	18
LOS ANGELES		0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2
TOTAL		5	8	8	6	49	6	12	20	14	11	12	3	6	7	7	7	12	12	6	8	16	16	8	6	265

NUMBER OF ARRIVALS AT GREAT FALLS

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
WASHINGTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
CLEVELAND		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
CHICAGO		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3
HOUSTON		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MINNEAPOLIS		2	1	1	1	1	0	0	0	0	0	0	1	1	0	1	2	1	0	1	1	0	0	3	0	17
KANSAS CITY		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
FORT WORTH		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
GREAT FALLS		5	2	6	7	3	2	50	4	17	20	10	17	5	3	1	6	8	3	9	9	8	5	6	6	212
DENVER		2	1	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	1	1	0	2	0	2	0	15
ALBUQUERQUE		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
SALT LAKE CY		0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	6
SEATTLE		1	1	0	2	0	0	0	1	0	0	0	0	0	1	0	0	2	1	2	0	0	0	1	1	13
OAKLAND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
LOS ANGELES		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
TOTAL		12	5	11	11	5	4	50	5	17	21	10	18	7	4	2	10	12	7	14	12	12	7	13	7	276

NUMBER OF HANDOFFS TO GREAT FALLS

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
MINNEAPOLIS		6	4	3	6	1	0	0	0	0	1	1	2	0	0	2	2	5	3	2	1	4	2	2	1	48
DENVER		1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	2	0	0	9
SALT LAKE CY		3	3	3	1	1	1	0	0	1	1	0	2	0	0	0	0	2	3	2	1	2	1	1	2	30
SEATTLE		2	1	1	2	2	0	2	3	4	1	0	0	1	1	2	10	9	5	1	3	5	2	3	8	68
TOTAL		12	9	8	9	4	1	2	3	5	3	1	4	1	1	5	12	17	12	5	6	11	7	6	11	155

NUMBER OF DEPARTURES FROM DENVER

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
BOSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
NEW YORK		0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	2	0	0	0	0	0	1	7
WASHINGTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	1	1	5
MIAMI		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
ATLANTA		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
INDIANAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
CHICAGO		0	4	2	2	1	1	0	1	1	0	0	2	4	4	2	2	4	4	6	4	2	1	4	4	55
MEMPHIS		0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	4
HOUSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	1	0	2	0	7
MINNEAPOLIS		1	1	1	0	0	0	0	0	0	0	0	0	2	0	1	1	2	2	1	2	0	0	2	1	17
KANSAS CITY		4	3	0	0	2	0	1	0	1	1	0	0	1	4	4	1	1	4	4	3	3	3	1	1	42
FORT WORTH		2	1	0	0	0	0	0	0	0	1	0	0	1	0	2	1	2	2	2	1	0	0	5	3	23
GREAT FALLS		2	0	1	2	0	0	0	1	0	0	0	0	0	1	1	0	0	2	1	0	2	1	0	1	15
DENVER		17	14	11	12	9	6	2	3	1	1	2	6	12	24	20	23	18	26	11	21	19	19	19	14	310
ALBUQUERQUE		1	2	4	1	0	1	0	0	0	0	0	1	4	0	3	4	0	4	1	2	3	2	2	1	36
SALT LAKE CY		1	1	2	1	1	0	1	0	1	0	0	0	1	2	5	2	1	4	1	1	4	3	2	5	39
SEATTLE		1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	1	0	1	9
OAKLAND		2	0	0	2	0	0	0	0	0	0	0	0	1	1	0	2	0	1	0	0	2	2	0	1	14
LOS ANGELES		3	1	2	0	0	0	0	0	1	0	0	0	1	1	3	2	2	2	4	1	1	0	3	0	27
TOTAL		34	28	23	22	13	8	5	5	5	3	2	9	28	38	45	43	32	56	32	35	37	33	42	36	614

NUMBER OF ARRIVALS AT DENVER

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
BOSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
NEW YORK		2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	1	0	7
WASHINGTON		0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	4
CLEVELAND		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
ATLANTA		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	3
INDIANAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
CHICAGO		4	5	1	6	0	2	3	0	2	1	1	0	0	0	1	2	5	3	4	2	2	3	4	2	53
MEMPHIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2
HOUSTON		0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	4	0	1	0	9
MINNEAPOLIS		1	1	0	2	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	8
KANSAS CITY		4	5	3	1	2	4	0	1	0	1	0	0	0	0	2	2	4	1	1	2	3	1	2	4	43
FORT WORTH		3	2	1	1	1	0	0	0	1	0	0	0	0	0	1	2	3	2	0	2	1	4	5	3	32
GREAT FALLS		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	4	1	10
DENVER		19	16	13	12	13	7	7	1	3	1	1	1	10	12	23	21	19	23	23	10	22	20	16	17	310
ALBUQUERQUE		3	4	5	3	0	0	2	1	0	0	1	0	0	1	0	1	2	1	2	0	2	0	2	3	33
SALT LAKE CY.		1	0	2	3	0	1	1	1	1	0	1	0	0	0	1	3	0	1	3	3	0	2	1	1	26
SEATTLE		0	1	1	0	2	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1	0	9
OAKLAND		1	1	0	1	2	1	0	0	0	0	0	0	0	0	0	0	7	1	2	2	1	1	1	1	22
LOS ANGELES		3	0	2	1	2	1	2	0	0	0	1	0	0	0	0	0	1	1	4	1	0	3	2	1	25
TOTAL		42	38	31	30	23	16	15	4	7	3	5	1	11	13	31	33	44	38	42	23	38	38	42	33	601

NUMBER OF HANDOFFS TO DENVER

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
CHICAGO		26	20	12	12	4	5	6	2	7	8	5	3	0	5	7	23	20	14	17	14	17	12	16	21	276
MINNEAPOLIS		2	1	1	3	0	0	1	1	0	0	1	0	0	4	1	0	2	1	0	2	2	0	0	0	22
KANSAS CITY		13	12	10	4	3	2	3	2	3	0	0	1	1	1	4	12	13	5	7	13	7	11	6	14	147
GREAT FALLS		1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2	1	0	0	0	3	0	10
ALBUQUERQUE		20	10	9	9	2	5	4	1	1	1	2	0	3	1	1	10	7	10	6	4	3	11	12	6	138
SALT LAKE CY		11	10	8	5	5	6	9	4	11	2	3	0	0	2	2	11	28	29	18	13	10	15	18	14	234
LOS ANGELES		12	11	4	8	7	4	2	14	12	10	3	1	1	0	1	4	11	22	22	13	20	23	13	13	231
TOTAL		85	65	44	41	21	22	25	24	34	21	14	5	6	13	16	60	82	83	71	59	59	72	68	68	1058

NUMBER OF DEPARTURES FROM ALBUQUERQUE

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
BOSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
NEW YORK		0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	5
WASHINGTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
JACKSONVILLE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	1	5
MIAMI		1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	1	0	0	0	5
ATLANTA		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2
INDIANAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	2
CHICAGO		0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	3	1	2	0	2	3	0	2	1	18
MEMPHIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	1	0	1	1	1	10
HOUSTON		0	3	0	1	1	0	0	1	0	0	1	0	0	0	2	0	2	2	6	4	4	3	0	3	33
MINNEAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
KANSAS CITY		0	1	1	0	1	0	0	0	0	0	0	1	1	0	2	3	4	1	2	5	2	0	1	1	26
FORT WORTH		2	3	3	2	2	0	0	0	0	0	2	4	2	5	9	3	8	3	8	5	10	6	2		79
GREAT FALLS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
DENVER		4	6	1	0	1	1	1	0	0	1	0	0	1	0	1	2	3	0	1	1	1	3	1	4	33
ALBUQUERQUE		9	18	6	5	8	5	1	2	2	2	0	0	1	12	34	44	25	23	22	27	36	31	23	13	349
SALT LAKE CY		1	0	2	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	0	0	7
OAKLAND		4	0	1	2	1	0	0	0	0	0	1	1	0	0	2	1	1	0	4	1	3	1	0	5	28
LOS ANGELES		10	10	12	4	3	1	1	0	0	0	1	0	1	0	9	5	10	5	3	4	6	6	10	10	111
TOTAL		31	42	26	14	18	7	4	4	3	4	3	5	8	15	59	68	54	44	43	57	62	58	46	42	717

NUMBER OF ARRIVALS AT ALBUQUERQUE

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
NEW YORK		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
WASHINGTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
JACKSONVILLE		1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	6
MIAMI		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
ATLANTA		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	4
INDIANAPOLIS		0	1	0	2	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	8
CHICAGO		3	0	3	2	2	0	1	0	0	0	0	0	0	0	1	0	1	1	1	3	3	2	2	0	25
MEMPHIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	3	0	0	7
HOUSTON		1	4	0	0	0	0	0	0	1	0	0	0	0	1	0	7	4	5	3	3	4	5	10	7	55
KANSAS CITY		2	3	1	1	1	0	1	0	0	0	1	0	0	0	0	0	4	0	1	2	1	4	3	1	26
FORT WORTH		5	3	7	2	2	3	0	0	0	0	0	0	1	3	8	4	5	3	4	10	3	12	15	11	101
DENVER		1	1	3	4	1	0	1	0	0	0	0	0	0	4	2	2	2	1	3	1	2	2	4	2	36
ALBUQUERQUE		16	10	12	11	7	8	4	2	3	1	2	0	0	0	8	30	43	24	24	24	25	34	29	32	349
SALT LAKE CY		1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	2	0	0	8
SEATTLE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0	0	1	6
OAKLAND		1	6	1	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	1	4	3	3	0	23
LOS ANGELES		12	4	3	3	9	6	4	1	1	1	0	0	0	0	2	6	7	4	6	12	9	6	5	10	111
TOTAL		44	33	30	27	22	19	11	3	5	2	3	0	2	8	21	52	70	42	49	61	55	74	72	64	769

NUMBER OF HANDOFFS TO ALBUQUERQUE

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	MST	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
HOUSTON		0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	2	0	0	0	0	0	1	2	9
KANSAS CITY		5	3	3	7	1	1	2	0	0	2	0	0	1	1	2	6	4	3	8	2	3	8	2	8	72
FORT WORTH		19	15	16	11	11	5	8	3	3	1	1	1	2	13	16	14	25	20	23	19	21	43	30	27	347
DENVER		6	7	6	8	5	0	3	1	0	2	1	0	1	4	3	6	5	7	15	18	7	12	10	9	136
LOS ANGELES		24	8	8	8	8	6	7	7	4	3	4	0	3	1	4	16	14	16	15	18	26	18	13	16	247
TOTAL		54	33	33	35	25	12	20	11	7	8	6	1	7	19	26	44	50	46	61	57	57	81	56	62	811

NUMBER OF DEPARTURES FROM SALT LAKE CY

TO	AT GMT / PST	1 / 17	2 / 18	3 / 19	4 / 20	5 / 21	6 / 22	7 / 23	8 / 24	9 / 1	10 / 2	11 / 3	12 / 4	13 / 5	14 / 6	15 / 7	16 / 8	17 / 9	18 / 10	19 / 11	20 / 12	21 / 13	22 / 14	23 / 15	24 / 16	TOTAL
ATLANTA		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
CHICAGO		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	3
HOUSTON		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MINNEAPOLIS		0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	4
KANSAS CITY		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
FORT WORTH		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	4
GREAT FALLS		0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2	0	1	0	0	0	6
DENVER		1	2	2	0	1	1	1	1	0	1	0	0	0	2	2	0	2	3	2	0	3	1	1	0	26
ALBUQUERQUE		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	3	1	0	1	0	0	8
SALT LAKE CY		7	10	5	4	7	2	2	2	1	4	4	0	2	1	10	6	9	12	13	16	15	13	9	14	168
SEATTLE		1	1	1	3	3	0	1	1	0	1	0	0	0	0	0	0	3	0	3	0	5	1	2	0	26
OAKLAND		3	4	2	0	1	0	1	0	0	0	0	1	0	1	1	1	2	1	4	1	1	3	1	3	31
LOS ANGELES		2	1	1	0	2	0	0	0	0	0	3	0	0	0	1	0	3	0	2	0	1	0	2	4	22
TOTAL		14	21	11	7	16	3	5	5	1	7	8	1	2	5	16	8	21	17	30	18	27	20	16	22	301

NUMBER OF ARRIVALS AT SALT LAKE CY

FROM	AT GMT / PST	1 / 17	2 / 18	3 / 19	4 / 20	5 / 21	6 / 22	7 / 23	8 / 24	9 / 1	10 / 2	11 / 3	12 / 4	13 / 5	14 / 6	15 / 7	16 / 8	17 / 9	18 / 10	19 / 11	20 / 12	21 / 13	22 / 14	23 / 15	24 / 16	TOTAL
NEW YORK		0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
CHICAGO		0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	4
HOUSTON		0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
MINNEAPOLIS		0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	3
KANSAS CITY		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
FORT WORTH		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3
GREAT FALLS		0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	2	2	10
DENVER		5	0	2	1	2	1	0	1	0	1	0	0	0	0	5	2	2	1	5	1	0	4	2	4	39
ALBUQUERQUE		0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	7
SALT LAKE CY		15	7	8	9	3	6	2	2	1	2	3	3	2	2	3	7	6	7	14	13	13	19	11	10	168
SEATTLE		0	1	1	3	4	0	1	0	0	1	1	0	1	1	2	2	5	3	0	0	0	1	3	0	30
OAKLAND		3	0	2	0	0	1	0	0	0	0	1	1	0	0	0	3	0	1	1	2	1	2	1	1	20
LOS ANGELES		2	2	0	0	4	0	0	0	2	0	0	0	0	0	0	0	2	1	0	0	2	0	1	0	16
TOTAL		25	11	16	18	13	9	4	5	3	4	5	4	3	4	12	16	16	14	22	17	16	29	22	17	305

NUMBER OF HANDOFFS TO SALT LAKE CY

FROM	AT GMT / PST	1 / 17	2 / 18	3 / 19	4 / 20	5 / 21	6 / 22	7 / 23	8 / 24	9 / 1	10 / 2	11 / 3	12 / 4	13 / 5	14 / 6	15 / 7	16 / 8	17 / 9	18 / 10	19 / 11	20 / 12	21 / 13	22 / 14	23 / 15	24 / 16	TOTAL
GREAT FALLS		3	1	1	0	0	0	0	0	2	0	0	0	1	1	3	1	5	2	2	0	1	2	8	2	35
DENVER		21	17	12	13	9	2	4	2	2	6	3	4	1	2	9	7	17	18	14	3	8	17	14	11	216
SEATTLE		4	1	5	5	1	1	0	1	1	0	1	0	1	1	5	5	11	5	2	2	2	2	3	2	61
OAKLAND		8	3	5	2	4	6	4	5	4	2	0	1	0	1	3	19	18	14	6	10	10	15	9	8	157
LOS ANGELES		1	2	1	5	4	0	0	2	1	0	0	0	0	0	1	0	5	3	1	3	1	1	1	1	33
TOTAL		37	24	24	25	18	9	8	10	10	8	4	5	3	5	21	32	56	42	25	18	22	37	35	24	502

NUMBER OF DEPARTURES FROM SEATTLE

AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
TO																									TOTAL
BOSTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
NEW YORK	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	0	0	7
WASHINGTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	4
JACKSONVILLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
CHICAGO	1	0	0	0	0	0	2	3	0	0	0	0	0	0	6	1	1	0	3	1	2	1	4	1	26
HOUSTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2
MINNEAPOLIS	0	1	0	0	2	0	0	0	0	1	0	0	0	0	0	2	0	0	0	1	0	0	1	0	8
KANSAS CITY	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	2	0	0	0	0	0	1	0	1	7
FORT WORTH	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	1	0	7
GREAT FALLS	0	0	2	0	0	0	1	0	0	0	0	0	1	0	0	3	1	1	0	0	0	1	3	0	13
DENVER	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	0	1	0	1	9
ALBUQUERQUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	2	0	0	0	0	0	0	6
SALT LAKE CY	0	3	4	2	0	0	0	1	0	1	0	1	1	3	4	4	1	0	0	0	2	2	0	1	30
SEATTLE	22	28	16	15	15	19	16	21	21	16	12	9	15	25	33	27	37	36	30	25	22	16	24	30	530
OAKLAND	5	3	4	2	2	0	0	1	2	0	1	1	3	1	3	5	5	4	2	7	4	9	7	3	74
LOS ANGELES	3	2	0	1	2	0	0	0	1	0	0	0	0	0	2	2	1	1	2	2	0	4	0	0	23
TOTAL	32	38	28	20	21	21	20	27	24	18	13	12	20	31	50	55	52	44	39	40	31	35	40	37	748

NUMBER OF ARRIVALS AT SEATTLE

AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
FROM																									TOTAL
BOSTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
NEW YORK	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
WASHINGTON	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
CHICAGO	1	1	3	1	1	1	1	0	0	1	1	1	1	0	0	0	0	0	2	2	0	1	1	0	19
HOUSTON	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MINNEAPOLIS	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	5
KANSAS CITY	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	6
FORT WORTH	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
GREAT FALLS	0	2	0	2	1	0	1	0	0	0	1	0	0	1	0	1	0	1	1	0	1	3	2	1	18
DENVER	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	1	9
SALT LAKE CY	2	1	1	1	1	3	1	2	0	0	1	1	0	0	0	0	0	0	2	4	0	3	2	1	26
SEATTLE	30	26	23	17	16	16	16	19	8	25	15	13	19	13	24	29	29	41	32	30	26	21	19	23	530
OAKLAND	4	3	2	5	4	0	2	0	1	0	1	0	0	0	0	3	7	5	5	3	3	3	3	3	57
LOS ANGELES	3	1	2	1	3	1	1	0	0	0	0	1	0	0	0	0	0	2	2	1	1	0	2	2	23
TOTAL	42	37	32	33	28	22	24	21	9	26	19	16	20	14	24	33	38	53	46	41	32	31	29	32	702

NUMBER OF HANDOFFS TO SEATTLE

AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
FROM																									TOTAL
GREAT FALLS	2	6	7	1	4	2	0	0	1	0	2	2	1	0	1	1	1	4	5	1	1	4	3	2	51
SALT LAKE CY	2	3	2	2	4	4	2	1	0	1	0	1	0	0	2	0	1	3	5	2	1	5	2	3	46
OAKLAND	6	2	5	8	3	3	0	0	1	1	1	0	0	1	1	5	8	10	5	3	2	5	5	5	80
TOTAL	10	11	14	11	11	9	2	1	2	2	3	3	1	1	4	6	10	17	15	6	4	14	10	10	177

NUMBER OF DEPARTURES FROM OAKLAND

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
BOSTON		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	3
NEW YORK		1	0	0	0	2	2	3	1	0	0	0	0	1	0	2	6	5	2	2	3	2	0	3	1	36
WASHINGTON		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	5
JACKSONVILLE		1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	4
MIAMI		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
CLEVELAND		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	1	0	0	6
ATLANTA		0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	4
INDIANAPOLIS		0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3
CHICAGO		1	0	0	1	1	2	2	3	0	1	0	0	0	0	3	4	4	1	3	2	2	4	2	2	38
HOUSTON		0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	1	2	1	1	0	2	10
MINNEAPOLIS		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3
KANSAS CITY		1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	2	0	0	1	8
FORT WORTH		0	0	0	0	0	0	0	0	1	0	0	0	0	1	3	1	0	2	1	0	0	0	0	3	12
GREAT FALLS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
DENVER		0	1	2	1	0	0	0	0	0	0	0	0	0	1	6	2	2	1	2	1	1	0	1	1	22
ALBUQUERQUE		1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	1	2	3	3	0	1	6	23
SALT LAKE CY		0	2	0	1	0	0	0	0	0	1	1	0	0	2	1	1	1	2	1	2	0	2	2	1	20
SEATTLE		2	3	6	1	2	0	0	1	1	0	0	0	1	1	5	6	4	7	3	2	2	3	4	3	57
OAKLAND		30	33	37	26	16	11	8	2	3	1	0	2	15	33	36	58	52	39	40	38	25	23	31	38	597
LOS ANGELES		18	16	12	11	10	10	7	5	1	1	2	1	1	13	19	24	23	15	17	11	11	16	19	13	276
TOTAL		55	58	57	44	33	26	21	12	6	4	3	3	18	51	81	111	98	70	74	64	54	53	63	72	1131

NUMBER OF ARRIVALS AT OAKLAND

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
BOSTON		0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	6
NEW YORK		1	1	1	2	2	0	0	2	0	0	3	0	1	0	0	0	1	1	2	2	3	3	1	3	29
WASHINGTON		0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	5
JACKSONVILLE		0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4
MIAMI		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
CLEVELAND		0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	1	0	0	0	0	0	7
ATLANTA		0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
INDIANAPOLIS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2
CHICAGO		1	3	2	2	2	2	0	0	0	0	0	2	3	0	0	0	0	1	4	0	0	1	5	2	30
HOUSTON		1	2	1	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	2	1	0	0	0	11
MINNEAPOLIS		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	3
KANSAS CITY		0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0	1	11
FORT WORTH		1	1	2	0	0	1	1	0	0	0	0	0	0	0	0	0	2	1	2	1	0	0	2	0	14
DENVER		1	0	2	1	0	2	0	0	0	0	0	0	0	0	1	1	0	2	0	1	0	0	1	2	14
ALBUQUERQUE		0	7	3	1	1	2	0	0	0	0	0	0	1	0	0	1	2	1	0	1	2	2	2	2	28
SALT LAKE CY		4	2	3	4	1	0	1	0	1	0	0	0	0	1	0	2	0	2	1	3	1	3	1	1	31
SEATTLE		8	6	6	3	3	1	2	0	0	3	0	0	2	0	1	4	3	7	3	4	1	8	4	5	74
OAKLAND		38	29	40	28	31	17	11	6	2	2	2	0	3	14	28	43	40	66	36	43	36	25	27	30	597
LOS ANGELES		22	23	38	19	12	15	17	13	2	2	3	0	1	1	3	6	16	10	14	15	17	18	15	15	297
TOTAL		77	80	103	63	56	42	32	23	6	7	11	2	11	16	33	58	66	95	65	74	63	61	61	63	1168

NUMBER OF HANDOFFS TO OAKLAND

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
SALT LAKE CY		9	11	13	8	11	2	0	1	2	0	2	3	3	1	3	1	6	16	9	10	5	8	10	7	141
SEATTLE		4	7	4	5	3	5	0	0	1	3	0	1	1	0	4	5	7	6	3	4	7	6	7	11	94
LOS ANGELES		25	47	30	24	14	25	15	10	2	7	3	0	2	1	5	12	21	16	12	24	18	24	24	21	382
TOTAL		38	65	47	37	28	32	15	11	5	10	5	4	6	2	12	18	34	38	24	38	30	38	41	39	617

NUMBER OF DEPARTURES FROM LOS ANGELES

TO	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
BOSTON		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	6
NEW YORK		2	0	0	0	0	0	9	1	0	1	0	0	0	0	1	1	7	3	2	4	3	0	2	2	38
WASHINGTON		0	0	0	1	0	0	3	0	1	0	0	0	0	0	0	0	2	2	0	0	3	0	1	1	14
JACKSONVILLE		0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	2	0	0	0	2	3	0	0	1	11
MIAMI		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	3
CLEVELAND		1	0	0	1	1	0	1	3	0	1	0	0	0	0	0	0	2	3	0	2	0	1	1	0	17
ATLANTA		0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	5
INDIANAPOLIS		0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	5
CHICAGO		2	1	1	0	0	1	5	1	5	1	0	0	0	0	0	0	5	5	5	2	6	4	2	5	7	58
MEMPHIS		0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	3	0	1	1	8
HOUSTON		2	1	3	0	0	2	0	0	0	1	0	0	0	0	1	3	0	2	1	4	2	3	2	1	28
MINNEAPOLIS		0	1	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	1	1	0	0	0	7
KANSAS CITY		2	0	2	1	0	0	0	1	2	0	0	0	0	1	1	1	4	2	2	3	2	2	0	0	26
FORT WORTH		0	3	2	1	0	6	0	0	2	3	0	0	0	0	2	3	2	5	2	4	2	4	5	2	48
GREAT FALLS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
DENVER		0	3	0	2	2	0	0	0	1	0	0	0	0	0	2	1	2	2	0	4	0	3	2	1	25
ALBUQUERQUE		5	3	4	8	5	3	1	1	1	0	0	0	0	2	6	8	5	9	11	9	6	6	11	7	111
SALT LAKE CY		2	2	2	0	0	1	0	1	0	0	0	0	0	0	0	2	1	0	2	0	0	1	1	1	16
SEATTLE		2	1	2	1	1	0	0	0	0	1	0	0	0	0	0	2	2	1	1	0	4	2	2	1	23
OAKLAND		31	24	22	7	19	15	10	2	2	2	0	1	1	4	9	16	10	13	18	17	15	17	20	22	297
LOS ANGELES		54	54	57	37	39	32	10	10	2	8	4	8	9	24	49	65	67	76	71	68	89	62	62	78	1035
TOTAL		103	93	95	59	67	62	41	23	17	18	4	12	10	31	73	111	115	124	115	126	139	105	115	125	1783

NUMBER OF ARRIVALS AT LOS ANGELES

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
BOSTON		0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	2	0	0	0	0	10
NEW YORK		0	4	0	3	0	1	0	0	0	1	2	0	0	0	0	0	2	2	3	0	1	1	2	0	22
WASHINGTON		0	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	1	1	1	1	0	1	0	12
JACKSONVILLE		2	2	0	0	1	1	2	0	7	3	0	0	0	0	0	0	0	0	0	1	1	2	0	0	22
MIAMI		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	3
CLEVELAND		2	1	2	0	0	2	0	0	0	0	1	1	0	0	0	2	1	2	2	2	0	0	0	0	18
ATLANTA		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
INDIANAPOLIS		0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	4
CHICAGO		1	6	1	3	4	2	2	0	2	1	2	1	2	1	0	1	1	4	5	3	3	4	4	2	55
MEMPHIS		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	3
HOUSTON		4	4	0	1	2	0	1	2	0	1	1	1	1	0	0	2	0	0	2	3	3	1	3	1	33
MINNEAPOLIS		1	1	1	0	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	1	0	2	0	0	10
KANSAS CITY		2	1	3	2	1	0	0	3	0	1	0	0	1	0	0	0	0	2	0	0	1	3	2	0	22
FORT WORTH		4	4	1	4	2	2	0	1	1	0	0	1	0	2	0	4	2	4	3	3	1	6	3	4	52
GREAT FALLS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2
DENVER		1	2	4	0	2	0	0	0	0	1	0	0	0	1	1	3	1	2	3	4	1	1	1	0	27
ALBUQUERQUE		8	11	9	11	8	3	1	2	1	0	0	1	0	1	0	6	5	10	5	3	5	4	6	11	111
SALT LAKE CY		3	3	3	1	0	2	0	0	0	0	0	3	0	0	0	1	0	0	2	2	0	2	0	0	22
SEATTLE		2	0	3	1	1	1	2	0	0	0	1	0	0	0	0	0	2	2	2	0	2	1	0	3	23
OAKLAND		11	20	21	11	8	12	12	6	5	1	2	1	2	0	11	16	26	17	20	20	11	11	14	18	276
LOS ANGELES		65	64	57	42	40	42	24	16	7	1	2	10	4	15	31	47	64	64	88	65	72	84	60	71	1035
TOTAL		106	132	108	79	71	69	44	31	24	9	12	19	10	19	45	80	111	112	136	113	105	122	96	111	1764

NUMBER OF HANDOFFS TO LOS ANGELES

FROM	AT GMT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
	PST	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
DENVER		26	22	10	14	8	3	5	6	2	8	3	2	4	1	5	11	20	13	14	16	10	13	9	8	233
ALBUQUERQUE		28	17	10	18	14	6	4	6	5	4	0	2	3	4	5	11	10	12	21	16	9	17	16	13	251
SALT LAKE CY		6	2	3	3	0	3	0	1	0	2	1	3	0	0	0	1	3	3	1	3	4	5	2	1	47
OAKLAND		21	24	19	15	12	13	11	7	5	1	3	2	1	1	15	26	28	29	17	21	17	16	16	23	343
TOTAL		81	65	42	50	34	25	20	20	12	15	7	9	8	6	25	49	61	57	53	56	40	51	43	45	874

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